REGULAR MEETING AGENDA

Date: 3/9/2026
Time: 7:00 p.m.
Location: Zoom.us/join – ID# 846 9472 6242 and
City Council Chambers
751 Laurel St., Menlo Park, CA 94025

Members of the public can listen to the meeting and participate using the following methods.

How to participate in the meeting

- Access the live meeting, in-person, at the City Council Chambers
- Access the meeting real-time online at:
  zoom.us/join – Meeting ID# 846 9472 6242
- Access the meeting real-time via telephone (listen only mode) at:
  (669) 900-6833
  Regular Meeting ID # 846 9472 6242
  Press *9 to raise hand to speak
- Submit a written comment online up to 1-hour before the meeting start time:
  planning.commission@menlopark.gov*
  Please include the agenda item number related to your comment.

  *Written comments are accepted up to 1 hour before the meeting start time. Written messages are provided to the Planning Commission at the appropriate time in their meeting.

Subject to change: The format of this meeting may be altered or the meeting may be canceled. You may check on the status of the meeting by visiting the city website menlopark.gov. The instructions for logging on to the webinar and/or the access code is subject to change. If you have difficulty accessing the webinar, please check the latest online edition of the posted agenda for updated information (menlopark.gov/agendas).

Regular Meeting

A. Call To Order

B. Roll Call

C. Reports and Announcements

D. Public Comment

Under “Public Comment,” the public may address the Commission on any subject not listed on the agenda. Each speaker may address the Commission once under public comment for a limit of three minutes. You are not required to provide your name or City of residence, but it is helpful. The

Commission cannot act on items not listed on the agenda and, therefore, the Commission cannot respond to non-agenda issues brought up under Public Comment other than to provide general information.

E. Consent Calendar

None

F. Public Hearing Items

F1. Use Permit/Thomas James Homes/365 Arden Rd.:
Consider and adopt a resolution to approve a use permit to demolish an existing single-story, single-family residence to construct a new two-story, single-family residence with an attached garage on a substandard lot with regard to minimum lot area and lot width in the R-1-S (FG) Single Family Suburban Residential (Felton Gables) zoning district at 365 Arden Rd., and determine this action is categorically exempt under CEQA Guidelines Section 15303's Class 3 exemption for new construction or conversion of small structures. The project includes an attached accessory dwelling unit (ADU), which is a permitted use and not subject to discretionary review. (Staff report #26-003-PC)

F2. Use Permit Revision/Atria Health and Research Institute/333 Middlefield Rd.:
Consider and adopt a resolution to approve a use permit revision to operate a medical office at an existing commercial office building that is substandard with regard to the minimum parking requirement in the C-1 (Administrative and Professional, Restrictive) zoning district at 333 Middlefield Road, and determine this action is categorically exempt under CEQA Guidelines Section 15301's Class 1 exemption for existing facilities. (Staff report #26-004-PC)

G. Public Meeting Item

G1. 2025 General Plan Annual Progress Report/City of Menlo Park:
Consider and adopt a resolution recommending the City Council accept the 2025 General Plan Annual Progress Report, including progress implementing the Housing Element and Environmental Justice Element; the General Plan Annual Progress Report is not considered a project under CEQA. ***Continue to the meeting of March 23, 2026***

H. Informational Items

H1. Future Planning Commission Meeting Schedule – The upcoming Planning Commission meetings are listed here, for reference. No action will be taken on the meeting schedule, although individual Commissioners may notify staff of planned absences.

- Regular Meeting: March 23, 2026
- Regular Meeting: April 13, 2026

I. Adjournment

At every regular meeting of the Planning Commission, in addition to the public comment period where the public shall have the right to address the Planning Commission on any matters of public interest not listed on the agenda, members of the public have the right to directly address the Planning Commission on any item listed on the agenda at a time designated by the chair, either before or during the Planning Commission's consideration of the item.

At every special meeting of the Planning Commission, members of the public have the right to directly address the Planning Commission on any item listed on the agenda at a time designated by the chair, either before or during consideration of the item. For appeal hearings, appellant and applicant shall each have 10 minutes for presentations.

If you challenge any of the items listed on this agenda in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the City of Menlo Park at, or before, the public hearing.

Any writing that is distributed to a majority of the Planning Commission by any person in connection with an agenda item is a public record (subject to any exemption under the Public Records Act) and is available by request by emailing the city clerk at jaherren@menlopark.gov. Persons with disabilities, who require auxiliary aids or services in attending or participating in Planning Commission meetings, may call the City Clerk's Office at 650-330-6620.

Agendas are posted in accordance with Cal. Gov. Code §54954.2(a) or §54956. Members of the public can view electronic agendas and staff reports by accessing the city website at menlopark.gov/agendas and can receive email notifications of agenda postings by subscribing at menlopark.gov/subscribe. Agendas and staff reports may also be obtained by contacting City Clerk at 650-330-6620. (Posted: 3/4/2026)

STAFF REPORT

Planning Commission
Meeting Date: **3/9/2026**
Staff Report Number: **26-003-PC**

Public Hearing: **Consider and adopt a resolution to demolish an existing single-story, single-family residence and construct a new two-story, single-family residence on a substandard lot with regard to minimum lot area and lot width in the R-1-S (FG) (Single Family Suburban Residential (Felton Gables)) zoning district, at 365 Arden Road, and determine this action is categorically exempt under CEQA Guidelines Section 15303's Class 3 exemption for new construction or conversion of small structures. The proposal also includes an attached accessory dwelling unit (ADU), which is a permitted use and not subject to discretionary review.**

Recommendation

Staff recommends that the Planning Commission adopt a resolution approving a use permit to demolish an existing single-story, single-family residence and construct a new two-story, single-family residence on a substandard lot with regard to minimum lot area and lot width in the R-1-S (FG) (Single Family Suburban Residential (Felton Gables)) zoning district, at 365 Arden Road. The proposal also includes an attached accessory dwelling unit (ADU), which is a permitted use and not subject to discretionary review. The draft resolution, including the recommended actions and conditions of approval, is included as Attachment A.

Policy Issues

Each use permit request is considered individually. The Planning Commission should consider whether the required findings can be made for the proposal.

Background

Site Location

The subject site is located at 365 Arden Road, in the Felton Gables neighborhood off Encinal Avenue between El Camino Real and Middlefield Road. The immediate neighborhood is characterized primarily by one-story single-family homes, although two-story residences are interspersed throughout the area. The neighborhood exhibits a range of architectural styles, including traditional ranch, Craftsman, and contemporary designs, contributing to a varied but cohesive residential character. The surrounding properties share the same R-1-S (FG) zoning designation. A location map is included as Attachment B.

Analysis

Project description

The applicant is proposing to demolish the existing 1,650-square-foot single-story, single-family residence and an attached carport and construct a new two-story residence. The proposed residence would be an approximately 3,169-square-foot single-family residence containing four bedrooms, three- and one-half bathrooms, and an attached two-car garage.

The lot is substandard with respect to minimum lot area, at 9,019 square feet where 10,000 square feet is required, and minimum lot width, with approximately 75 feet where 80 feet is required. As a result, the proposal requires a use permit to allow a new two-story residence on a substandard lot.

Additionally, the project includes an approximately 489-square-foot attached ADU at the rear right side of the residence, with a ten-foot right side setback and 33.8-foot rear setback. The ADU would be accessed from a patio at the rear of the residence.

Two covered parking spaces are provided, which would meet the minimum parking requirement for the primary unit. A third uncovered parking space would be provided in the driveway for the attached ADU. The proposed driveway would be in the same general location as the existing driveway, towards the left side of the property.

The proposed project would meet all Zoning Ordinance requirements for setbacks, lot coverage, floor area limit (FAL), daylight plane, height, and parking. Of particular note with regard to Zoning Ordinance requirements:

- The total proposed FAL would be 3,658.19 square feet, where 3,203.8 square feet is permitted.
  - The project is allowed to exceed the FAL by up to 799.9 square feet to accommodate the proposed ADU.
- The total proposed building coverage would be 2,694.67, where 3,203.8 square feet is permitted.
  - The project is allowed to exceed the maximum building coverage limit by 799.9 square feet to accommodate the proposed ADU
- The main residence would have an 18-foot, 11-inch right side setback, and 11-foot left side setback where 10 feet is required.
- The ADU would have a 10-foot left side setback, where 4 feet is the minimum ADU setback.

The project plans and the applicant's project description letter are included as Attachment A, Exhibits A and B, respectively. A data table summarizing parcel and project attributes is included as Attachment C.

Design and materials

As described in the project description letter, the applicant is proposing a traditional-style two-story residence. The building would feature low-sloped roof forms with composition Timberline shingles and pre-primed wood fascia. The exterior siding is proposed as lap siding. The entry door would be fiberglass, and the garage door would be insulated steel. Windows are proposed as single-hung with gridded panes. Second-story windowsill heights are generally proposed at three feet or higher, meeting or exceeding the

typical three-foot minimum recommended by staff.

Staff believes the scale, materials, and style of the proposed residences would result in development that is appropriate for the lot and generally consistent with the broader neighborhood.

Trees and landscaping

The project arborist inventoried a total of 11 trees on site and on surrounding properties (eight on-site, two off-site, and one primarily on-site but straddling the left-side property line), with six trees being considered heritage trees. The applicant proposes to remove four trees, including one heritage tree (tree #2) which was conditionally approved by the City Arborist due to development-related purposes. Tree #5 (privet), which is a heritage tree may be considered for removal at a later date after the ivy is removed and the tree is reevaluated. All other trees would be retained. The arborist report specifies tree protection measures, including four tree protection zones to minimize potential injury to trees during construction. The proposed project includes two 24-inch box Chinese elm trees in the left rear corner of the property as heritage tree replacements. The City Arborist has reviewed the application, and all recommended tree protection measures identified in the arborist report would be ensured as part of draft condition 1h.

Table 1: Tree summary and disposition

ID #	Species	Trunk Diameter	Condition	Status	Removal or Retention	Off-site or On-site
1	Laurel	11	Poor	Non-heritage	Remove	On-site
2	Blackwood acacia	17	Fair	Heritage	Remove	On-site
3	Coast redwood	61	Good	Heritage	Retention	On-site
4	London plane tree	20	Good	Heritage	Retention	Off-Site
5	Privet	16	Fair	Heritage	Retention	On-site
6	English walnut	14	Fair	Non-heritage	Retention	On-site
7	Japanese cheesewood	11	Fair	Non-heritage	Remove	On-site
8	California bay laurel	15	Fair	Heritage	Retention	Off-site
9	California bay laurel	13	Fair	Non-heritage	Remove	On-site
10	California bay laurel	11	Fair	Non-heritage	Retention	On-site
11	Coast live oak	44	Good	Heritage	Retention	Partially on-site

Correspondence

The applicant states in their project description letter that they sent copies of the site plan, floor plan, elevations, and a letter addressing their project to neighbors within 300 feet and hosted a neighbor meeting via Zoom. However, no one attended. Staff also received correspondence from one neighbor who has concerns regarding window placements on the right side of the home, particularly in the area of the

proposed stairwell. The email correspondence is included as Attachment D.

As previously noted, the windows on the right side of the proposed residence would have sill heights of three feet or greater. Windows in the stairwell would have three-feet sill heights, and would be located in a transitional space where residents typically would not linger as they move between floors. The residence would also be set back 18 feet, 11 inches from the right-side property line, which exceeds the minimum required 10-foot setback. These factors, in combination with proposed fencing and landscaping would help to reduce potential privacy impacts.

Conclusion

Staff believes that the design, scale, and materials of the proposed residence are generally compatible with the surrounding neighborhood. The traditional style would be generally attractive and fit well within the existing neighborhood context. Window sill heights, building setbacks, landscaping and fencing are generally sufficient to mitigate potential privacy impacts. Staff recommends that the Planning Commission approve the use permit request.

Impact on City Resources

The project sponsor is required to pay Planning, Building and Public Works permit fees, based on the City's Master Fee Schedule, to fully cover the cost of staff time spent on the review of the project.

Environmental Review

The project is categorically exempt under Class 3 ("New construction or conversion of small structures") of the current California Environmental Quality Act (CEQA) Guidelines.

Public Notice

Public notification was achieved by posting the agenda, with the agenda items being listed, at least 72 hours prior to the meeting. Public notification also consisted of publishing a notice in the local newspaper and notification by mail of owners and occupants within a 300-foot radius of the subject property.

Attachments

A. Draft Planning Commission Resolution approving the Use Permit
   Exhibits to Attachment A
   A. Project Plans
   B. Project Description Letter
   C. Arborist Report
   D. Conditions of approval
B. Location Map
C. Correspondence
D. Data Table

Report prepared by:
Matthew Ball, Assistant Planner

Report reviewed by:
Tom Smith, Principal Planner

PLANNING COMMISSION RESOLUTION NO. XXXX

A RESOLUTION OF THE PLANNING COMMISSION OF THE CITY OF MENLO PARK APPROVING A USE PERMIT REQUEST TO DEMOLISH AN EXISTING SINGLE-STORY, SINGLE-FAMILY RESIDENCE AND CONSTRUCT A NEW TWO-STORY, SINGLE-FAMILY RESIDENCE ON A SUBSTANDARD LOT WITH REGARD TO MINIMUM LOT AREA AND LOT WIDTH IN THE R-1-S (FG) ZONING DISTRICT, AT 365 ARDEN DRIVE.

WHEREAS, the city of Menlo Park ("City") received an application requesting a use permit to demolish an existing single-story, single-family residence and construct a new two-story, single-family residence on a substandard lot with regard to minimum lot area and lot width in the R-1-S (FG) (Single Family Suburban Residential (Felton Gables)) zoning district (the "Project"), at 365 Arden Drive (APN 061-323-020) ("Property"). The Project use permit is depicted in and subject to the development plans and project description letter, which are attached hereto as Exhibit A and Exhibit B, respectively, and incorporated herein by this reference; and

WHEREAS, the Property is located in the Single Family Suburban Residential (Felton Gables) (R-1-S (FG)) zoning district**,** which supports single-family residential uses; and

WHEREAS, the Property is substandard with regard to minimum lot area and lot width in the R-1-S (FG) zoning district; and

WHEREAS, Menlo Park Municipal Code Chapter 16.59 allows new two-story homes on substandard lots subject to the granting of a use permit, provided the development complies with all other regulations in the applicable zoning district; and

WHEREAS, the proposed Project otherwise complies with all objective standards of the R-1-S (FG) zoning district; and

WHEREAS, the Applicant submitted an arborist report, attached hereto as Exhibit C, prepared by California Tree and Landscape Consulting, Inc., which was reviewed by the City Arborist and found to be in compliance with the Heritage Tree Ordinance, and proposes mitigation measures to adequately protect heritage trees in the vicinity of the project; and

WHEREAS, the Applicant has proposed to remove one heritage tree which was reviewed and tentatively approved pending Planning Commission review as part of Heritage Tree Removal Permit number HTR2025-00155; and

WHEREAS, the Project requires discretionary actions by the City as summarized above, and therefore the California Environmental Quality Act ("CEQA," Public Resources Code Section §21000 et seq.) and CEQA Guidelines (Cal. Code of Regulations, Title 14,

§15000 et seq.) require analysis and a determination regarding the Project's environmental impacts; and

WHEREAS, the City is the lead agency, as defined by CEQA and the CEQA Guidelines, and is therefore responsible for the preparation, consideration, certification, and approval of environmental documents for the Project; and

WHEREAS, the Project is categorically exempt from environmental review under Class 3 (Section 15303, "New construction or conversion of small structures") of the current California Environmental Quality Act (CEQA) Guidelines; and

WHEREAS, all required public notices and public hearings were duly given and held according to law; and

WHEREAS, at a duly and properly noticed public hearing held on March 9, 2026, the Planning Commission fully reviewed, considered, and evaluated the whole of the record including all public and written comments, pertinent information, documents and plans, prior to taking action regarding the Project.

NOW, THEREFORE, THE MENLO PARK PLANNING COMMISSION HEREBY RESOLVES AS FOLLOWS:

Section 1. Recitals. The Planning Commission has considered the full record before it, which may include but is not limited to such things as the staff report, public testimony, and other materials and evidence submitted or provided, and the Planning Commission finds the foregoing recitals are true and correct, and they are hereby incorporated by reference into this Resolution.

Section 2. Conditional Use Permit Findings. The Planning Commission of the City of Menlo Park does hereby make the following Findings:

The approval of the use permit to construct a new two-story residence on a substandard lot is granted based on the following findings, which are made pursuant to Menlo Park Municipal Code Section 16.82.030:

1. That the establishment, maintenance, or operation of the use applied for will, under the circumstance of the particular case, not be detrimental to the health, safety, morals, comfort and general welfare of the persons residing in the neighborhood of such proposed use, or injurious or detrimental to property and improvements in the neighborhood or the general welfare of the city because:

    a. Consideration and due regard were given to the nature and condition of all adjacent uses and structures, and to general plans for the area in question and surrounding areas, and impact of the application hereon; in that, the proposed use permit is consistent with the R-1-S (FG) zoning

district and the General Plan because two-story homes are allowed to be constructed on a substandard lot subject to issuance of a use permit, provided that the proposed residence conforms to applicable zoning standards, including, but not limited to, minimum setbacks, maximum floor area limit, and maximum building coverage.

b. The proposed Project is designed to meet all the applicable codes and ordinances of the City of Menlo Park Municipal Code and the Commission concludes that the Project would not be detrimental to the health, safety, and welfare of the surrounding community as the proposed residence would be located in a single-family neighborhood and has been designed in a way to complement the existing scale and style of surrounding homes.

Section 3. Conditional Use Permit. The Planning Commission approves Use Permit No. PLN2025-00044, which use permit is depicted in and subject to the development plans and project description letter, which are attached hereto and incorporated herein by this reference as Exhibit A and Exhibit B, respectively. The Use Permit is conditioned in conformance with the conditions attached hereto and incorporated herein by this reference as Exhibit D.

Section 4. Environmental review. The Planning Commission makes the following findings, based on its independent judgment after considering the Project, and having reviewed and taken into consideration all written and oral information submitted in this matter:

1. The Project is categorically exempt from environmental review under Class 3 (Section 15303, “New construction or conversion of small structures”) of the current California Environmental Quality Act (CEQA) Guidelines.

Section 5. Severability. If any term, provision, or portion of these findings or the application of these findings to a particular situation is held by a court to be invalid, void or unenforceable, the remaining provisions of these findings, or their application to other actions related to the Project, shall continue in full force and effect unless amended or modified by the City.

AYES:

NOES:

ABSENT:

ABSTAIN:

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Official Seal of said City on this __ day of March, 2026.

PC Liaison Signature

Corinna Sandmeier
Principal Planner
City of Menlo Park

Exhibits

A. Project plans
B. Project description letter
C. Arborist report
D. Conditions of approval

EXHIBIT A

365 ARDEN ROAD
MENLO PARK, CA

THOMAS JAMES HOMES
275 SHORE LINE Dr. Suite 400
REDWOOD CITY. CA . 94065
(650) 980 - 8340

ABBREVIATIONS

&	AND	F.O.S.	FACE OF STUDS	RJ	RAFTER JOIST
∠	ANGLE	FPL.	FIREPLACE	RM.	ROOM
@	AT	FPRF.	FIREPROOF	R.O.	ROUGH OPENING
℄	CENTERLINE	FR	FRENCH	RWD.	REDWOOD
Ø	DIAMETER OR ROUND	FRM'G	FRAMING	R.W.L.	RAIN WATER LEADER
(E)	EXISTING	F.S.	FULL SIZE	S.	SOUTH
d	PENNY	FT.	FOOT OR FEET	SC	SOLID CORE
℄	PROPERTY LINE	FTG.	FOOTING	S.C.D.	SEAT COVER DISPENSER
#	POUND OR NUMBER	FURR.	FURRING	SCHED.	SCHEDULE
A.B.	ANCHOR BOLT	FUT.	FUTURE	S.D.	SOAP DISPENSER
ABV.	ABOVE	FX	FIXED	SECT.	SECTION
A/C	AIR CONDENSER	GA.	GUAGE	SERV.	SERVICE
ACOUS.	ACOUSTICAL	GALV.	GALVANIZED	S.F.	SQUARE FEET
A.D.	AREA DRAIN	GAR	GARAGE	SGD	SLIDING GLASS DOOR
ADJ.	ADJUSTABLE	G.B.	GRAB BAR	SGL.	SINGLE
A.F.F	ABOVE FINISH FLOOR	GFI	GROUND FAULT INTERUPTER	SH	SINGLE HUNG
AGGR.	AGGREGATE	G.I.	GALVANIZED IRON	SHR.	SHOWER
AL.	ALUMINUM	GL.	GLASS / GLAZING	SHT.	SHEET
ALT.	ALTERNATE	GLB	GLUE LAMINATED BEAM	SHTG	SHEATHING
ALUM.	ALUMINUM	GND.	GROUND	SIM.	SIMILAR
APPROX.	APPROXIMATE	GR.	GRADE	SKYLT.	SKYLIGHT
ARCH.	ARCHITECT	GSM	GALVANIZED SHEET METAL	SL.	SLIDING
ARCH'L	ARCHITECTURAL	GYP.	GYPSUM	SL.	SLOPE
ASPH.	ASPHALT	GYP. BD.	GYPSUM BOARD	S.N.D.	SANITARY NAPKIN DISPENSER
AUTO.	AUTOMATIC	G.B.	GYPSUM BOARD	S.N.R.	SANITARY NAPKIN RECEPTACLE
				SOV	SHUTOFF VALVE
BA.	BATHROOM	H.B.	HOSE BIBB	SP.	SPACE
BD.	BOARD	HC	HOLLOW CORE	SPEC.	SPECIFICATIONS
BITUM.	BITUMINOUS	HDR.	HEADER	SQ.	SQUARE
BLDG.	BUILDING	HDWD.	HARDWOOD	S.SK.	SERVICE SINK
BLK.	BLOCK	HDWE.	HARDWARE	SSSP	SINGLE SHELF SINGLE POLE
BLKG.	BLOCKING	HM	HOLLOW METAL	SSDP	SINGLE SHELF DOUBLE POLE
BLK'G	BLOCKING	HORIZ.	HORIZONTAL	S.ST.	STAINLESS STEEL
BLT.	BOLT	HR.	HOUR	STA.	STATION
BM.	BEAM	HGT.	HEIGHT	STD.	STANDARD
BOT.	BOTTOM	H.V.A.C.	HEATING VENTILATION AIR CONDITIONING	STL.	STEEL
BR.	BEDROOM	HORZ.	HORIZONTAL	STOR.	STORAGE
B.U.R.	BUILT-UP ROOFING	I.D.	INSIDE DIAMETER	STRL.	STRUCTURAL
		INSUL.	INSULATION	STRUCT'L	STRUCTURAL
CAB.	CABINET	INT.	INTERIOR	STRUCT	STRUCTURE
C.B.	CATCH BASIN			SUSP.	SUSPENDED
CEM.	CEMENT	JAN.	JANITOR	SYM.	SYMMEMTRICAL
CER.	CERAMIC	JT.	JOINT		
C.I.	CAST IRON			T.B.	TOWEL BAR
CIR.	CIRCLE	KIT	KITCHEN	T.O.CURB	TOP OF CURB
C.G.	CORNER GUARD	LAB.	LABORATORY	TEL.	TELEPHONE
CJ	CEILING JOIST	LAM.	LAMINATE	TEMP.	TEMPERED
CLG.	CEILING	LAV.	LAVATORY	TER.	TERRAZZO
CLKG.	CAULKING	LKR.	LOCKER	T&G	TONGUE AND GROOVE
CLO.	CLOSET	LT.	LIGHT	THK.	THICK
CLR.	CLEAR / CLEARANCE			T.P.	TOP OF PAVEMENT
CMU	CONCRETE MASONRY UNIT	MAX.	MAXIMUM	T.P.D.	TOILET PAPER DISPENSER
C.O.	CASED OPENING	M.B.	MACHINE BOLT	TPL.	TOP PLATE
COL.	COLUMN	MBA	MASTER BATHROOM	TRD.	TREAD
CONC.	CONCRETE	MBR	MASTER BEDROOM	TRSM.	TRANSOM
CONN.	CONNECTION	MC	MEDICINE CABINET	T.V.	TELEVISION
CONSTR.	CONSTRUCTION	MECH.	MECHANICAL	TYP.	TYPICAL
CONT.	CONTINUOUS	MED.	MEDIUM	T.O.SHTG	TOP OF SHEATHING
C.O.F.	CORNER OF FINISH	MEMB.	MEMBRANE	T.O.C.	TOP OF CONCRETE
CORR.	CORRIDOR	MET.	METAL	T.O.P.	TOP OF PARAPET
CPT	CARPET	MFG	MANUFACTURING	T.O.W.	TOP OF WALL
CSMT	CASEMENT	MFR.	MANUFACTURER		
CTSK.	COUNTERSUNK	MH.	MANHOLE	UNF.	UNFINISHED
CNTR.	COUNTER	MIN.	MINIMUM	U.N.O.	UNLESS NOTED OTHERWISE
CTR.	CENTER	MIR.	MIRROR	U.O.N.	UNLESS OTHERWISE NOTED
		MISC.	MISCELLANEOUS	UR.	URINAL
DBL.	DOUBLE	MLD'G	MOULDING		
DEPT.	DEPARTMENT	M.O.	MASONRY OPENING	VCT	VINYL COMPOSITION TILE
D.F.	DRINKING FOUNTAIN	MTD.	MOUNTED	VERT.	VERTICAL
DET.	DETAIL	MUL.	MULLION	VEST.	VESTIBULE
DH	DOUBLE HUNG			VTR	VENT THROUGH ROOF
DIA.	DIAMETER	N.	NORTH	W.	WEST
DIM.	DIMENSION	NAT	NATURAL	W/	WITH
DISP.	DISPERNSER	NG	NATURAL GRADE	W.C.	WATER CLOSET
DIV.	DIVERTER	N.I.C.	NOT IN CONTRACT	WD.	WOOD
DN.	DOWN	NO.	NUMBER	WDW.	WINDOW
D.O.	DOOR OPENING	NOM.	NOMINAL	W.H.	WATER HEATER
DR.	DOOR	N.T.S.	NOT TO SCALE	W.I.	WROUGHT IRON
DS	DOWNSPOUT			W.I.C.	WALK-IN-CLOSET
D.S.P.	DRY STANDPIPE	O/	OVER	W/O	WITHOUT
DW	DISHWASHER	O.A.	OVERALL	WP	WEATHERPROOF
DWG'S	DRAWINGS	OBS.	OBSCURE	WS	WATER SOFTENER
DWR.	DRAWER	O.C.	ON CENTER	WSCT.	WAINSCOT
		O.D.	OUTSIDE DIAMETER (DIM.)	WT.	WEIGHT
E.	EAST	OFF.	OFFICE		
EA.	EACH	O.H.C.	OVERHEAD CABINET		
E.D.F.	DRINK FOUNTAIN	OPNG.	OPENING		
E.J.	EXPANSION JOINT	OPP.	OPPOSITE		
EL.	ELEVATION	OSA	OUTSIDE AIR		
ELEC.	ELECTRICAL				
ELEV.	ELEVATOR	PB	PUSH BUTTON		
EMER.	EMERGENCY	PDR	POWDER ROOM		
ENCL.	ENCLOSED	PRCST.	PRECAST		
E.P.	ELECTRICAL PANELBOARD	PL.	PLATE		
EQ.	EQUAL	P.LAM.	PLASTIC LAMINATE		
EQPT.	EQUIPMENT	PLAS.	PLASTER		
E.W.C.	ELECTRIC WATER COOLER	PLYWD.	PLYWOOD		
EXH.	EXHAUST	PNL.	PANEL		
EXST.	EXISTING	PTD.	PAINTED		
EXP.	EXPANSION	PLUMB.	PLUMBING		
EXPO.	EXPOSED	P.O.C.	POINT OF CONNECTION		
EXT.	EXTERIOR	PR.	PAIR		
EXT'G	EXISTING	PT.	POINT		
		PREFAB.	PREFABRICATED		
F.A.	FIRE ALARM	P.T.D.	PAPER TOWEL DISPENSER		
F.A.U.	FORCED AIR UNIT	P.T.D/R	COMBINATION PAPER TOWEL DISPERNSER & RECEPTACLE		
F.B.	FLAT BAR	PTN.	PARTITION		
F.D.	FLOOR DRAIN	P.T.R.	PAPER TOWEL RECEPTACLE		
FDN.	FOUNDATION				
F.E.	FIRE EXTINGUISHER	Q.T.	QUARRY TILE		
F.E.C.	FIRE EXTINGUISHER CABINET				
F.FLR.	FINISH FLOOR	R.	RISER		
FFL	FINISH FLOOR	R	RADIUS		
F.G.	FINISH GRADE / FUEL GAS	RAD.	RADIUS		
FGL	FIBERGLASS	R.A.G.	RETURN AIR GRILLE		
F.H.C.	FIRE HOSE CABINET	R.D.	ROOF DRAIN		
FIN.	FINISH	REF.	REFERENCE		
FJ	FLOOR JOIST	REFR.	REFRIGERATOR		
FLASH.	FLASHING	REG.	REGULAR		
FLASH'G	FLASHING	REV	REVERSE		
FLR	FLOOR	REINF	REINFORCE, REINFORCED		
FLUOR.	FLUORESCENT	RF'G	ROOFING		
F.O.C.	FACE OF CONCRETE	RGTR.	REGISTER		
F.O.F.	FACE OF FINISH	REQ.	REQUIRED		
F.O.M.	FACE OF MULLION	RESIL.	RESILIENT		

PROJECT DIRECTORY

BUILDER:
THOMAS JAMES HOMES
275 Shoreline Dr. Ste.400
Redwood City, Ca. 94065
(650) 434-7966
Contact: Ken King

ARCHITECT:
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Oakland, Ca. 94612
(510) 272-2910
Contact: Mohamed Eleraky
meleraky@ktgy.com

CIVIL:
CBG, Civil Engineers, Surveyors, Planners
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San Ramon, CA 94583
(925) 866-0322
Contact: Jorge Daniel Abich
j.d.abich@gmail.com

LANDSCAPE:
SKETCH & field
Landscape Arch / Exterior Design
1935 Addison Street, Suite A
Berkeley, CA 94704
(510) 905-7444
Contact: Jorge Daniel Abich
j.d.abich@gmail.com

PROJECT DATA

PROJECT DESCRIPTION:
NEW 2-STORY SINGLE-FAMILY RESIDENCE WITH 4 BEDROOMS, 3.5 BATHROOMS, AND ATTACHED 2-CAR GARAGE AND ATTACHED ADU.
DEMOLISH EXISTING 1-STORY HOUSE WITH ATTACHED CARPORT

PROJECT ADDRESS : 365 ARDEN ROAD, MENLO PARK CA 94025
APN : 061-323-020
ZONING : R-1-S (FG) ⚠
LOT SIZE: 9,019 S.F.

MAX FLOOR AREA (FAL) ALLOWED: 2,800 + 20%(LOT SIZE - 7,000)
2,800 + .20 (9,019 - 7,000) (LOT SIZE) = 3,203.8 SQ. FT. (INCLUDES GARAGE) ⚠

FAL PROVIDED:

1ST FLOOR:	1630.06 S.F.
GARAGE:	476.96 S.F.
SUBTOTAL:	2,107.02 S.F.
2ND FLOOR:	1,062.17 S.F.
TOTAL:	3,169.19 S.F.

ADU FLOOR AREA = 488.99 SQ.FT.

MAXIMUM BLDG. COVERAGE: 35% Max. (9,019 X .35 = 3,156.65 SQ. FT.)
ACTUAL COVERAGE AREA = 1630.06 + 476.96 + 98.66 = 2,205.68 SQ. FT. (24.45%)

SQUARE FOOTAGE PER INDUSTRY STANDARD:

FIRST FLOOR	1,630 SF
SECOND FLOOR	1,085 SF
TOTAL LIVING:	2,715 SF
GARAGE	489 SF
PORCH	90 SF
ADU	489 SF
TOTAL AREA:	3,783 SF

DWELLING SHALL COMPLY WITH CURRENT APPLICABLE CODES:
2022 CALIFORNIA RESIDENTIAL CODE (CRC)
2022 CALIFORNIA MECHANICAL CODE (CMC)
2022 CALIFORNIA PLUMBING CODE (CPC)
2022 CALIFORNIA ELECTRICAL CODE (CEC)
2022 CALIFORNIA FIRE CODE (CFC)
2022 CALIFORNIA ENERGY CODE (CEC)
2022 CALIFORNIA GREEN BUILDING STANDARDS CODE
CITY OF MENLO PARK BUILDING REGULATIONS & ORDINANCES
TYPE OF CONSTRUCTION: VB
OCCUPANCY GROUP: R3 & U (Garage)
AUTOMATIC SPRINKLER SYSTEM - NFPA 13D

VICINITY MAP NOT TO SCALE



GENERAL NOTES

- ANY FRONTAGE IMPROVEMENTS WHICH ARE DAMAGED AS A RESULT OF CONSTRUCTION WILL BE REQUIRED TO BE REPLACED. ALL FRONTAGE IMPROVEMENT WORK SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF THE CITY STANDARD DETAILS.
- AN ENCROACHMENT PERMIT FROM THE ENGINEERING DIVISION IS REQUIRED PRIOR TO ANY CONSTRUCTION ACTIVITIES, INCLUDING UTILITY LATERALS, IN THE PUBLIC RIGHT OF WAY

⚠

DEFERRED SUBMITTALS

SUBMITTAL DOCUMENTS FOR DEFERRED SUBMITTALS SHALL BE SUBMITTED TO THE ARCHITECT OR ENGINEER OF RECORD, WHO SHALL REVIEW THEM AND FORWARD THEM TO THE BUILDING OFFICIAL WITH A NOTATION INDICATING THAT THE DEFERRED SUBMITTAL DOCUMENTS HAVE BEEN REVIEWED AND FOUND TO BE IN GENERAL CONFORMANCE WITH THE DESIGN OF THE BUILDING. DEFERRED SUBMITTAL ITEMS SHALL NOT BE INSTALLED UNTIL THEY ARE REVIEWED BY ALL GOVERNING AGENCIES AND THE ARCHITECT. THREE (3) COPIES OF THE FOLLOWING SYSTEMS SHALL BE SUBMITTED TO THE ARCHITECT FOR REVIEW.

- AUTOMATIC FIRE SPRINKLER SYSTEM (N.F.P.A.-13D)
- DESIGN-BUILD ELEMENTS INCLUDING, BUT NOT LIMITED TO: AWNINGS AND SHADE STRUCTURES. WHERE REQUIRED, PROVIDE CALCULATIONS SIGNED AND STAMPED BY AND ENGINEER LICENSED IN THE STATE WHERE WORK IS PERFORMED.
- PHOTOVOLTAIC SYSTEM

SEPARATE PERMIT REQUIRED FOR:
- DEMOLITION OF EXISTING STRUCTURES

SHEET INDEX

ARCHITECTURAL

T1	TITLE SHEET
A1	SITE PLAN
A2	FIRST FLOOR PLAN
A2.1	SECOND FLOOR PLAN
A2.2	SQUARE FOOTAGE/ LOT COVERAGE
A4	SECTION
A5	ROOF PLAN
A6	EXTERIOR ELEVATIONS
A7	EXTERIOR ELEVATIONS
I-1.01	COLOR BOARD

LANDSCAPE

L1.0	NOTES & CALCULATIONS
L1.1	LAYOUT AND MATERIALS PLAN
L1.2	CONSTRUCTION DETAILS
L2.1	IRRIGATION PLAN
L2.2	IRRIGATION DETAILS
L3.1	PLANTING PLAN
L3.2	PLANTING DETAILS
L3.3	TREE PROTECTION PLAN
L3.4	TREE PROTECTION GUIDELINES
L3.5	TREE PROTECTION GUIDELINES
L3.6	SOIL MANAGEMENT REPORT

CIVIL

1	TOPOGRAPHIC & BOUNDARY SURVEY
AP-1	AREA PLAN

AS-BUILT ⚠

1	COVER PAGE
2	1ST FLOOR PLAN
3	ROOF PLAN
4	EXTERIOR ELEVATIONS

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Project Designer: Amanda House

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MENLO PARK, CA

No.	Date	Description
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	02/19/2026	4TH PLANNING SUBMITTAL

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PROJECT DATA, SHEET INDEX. AND VICINITY MAP

T1

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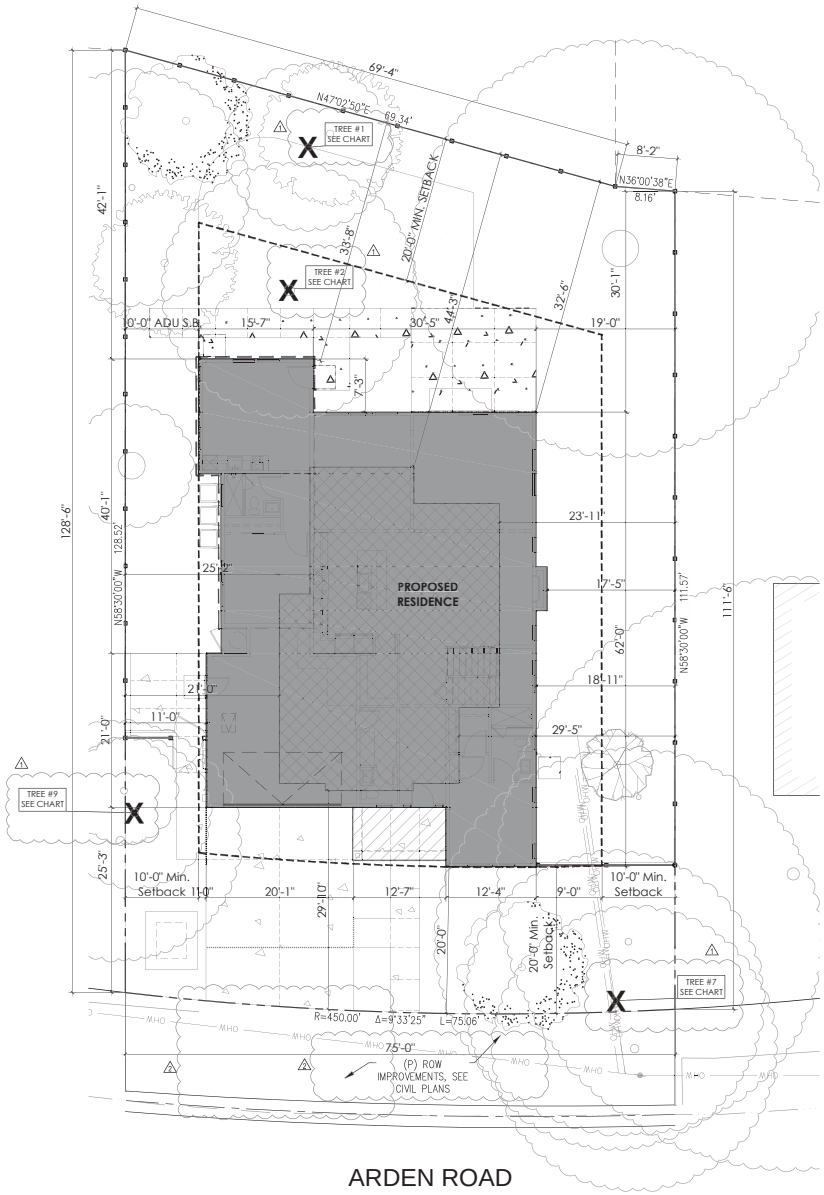

SITE LEGEND

New 2-Story Single Family Residence with an Attached 2-Car Garage.

Area of Second Floor Residence.

Area of Covered Porch and Covered Outdoor Room.

Keynote	Tag #	Heritage	Status	Common Name	Botanical Name	DBH (inches)	Status	Note
1	9806	N	N	Laurel	Laurus sp.	11	Remove	
2	9807	Y	N	Blackwood Acacia	Acacia melanoxylon	17	Remove	
3	9808	Y	N	Coast Redwood	Sequoia sempervirens	31	Retain and Protect	
4	9809	Y	Y	London Plane tree	Platanus x hispanica	23	Retain and Protect	
5	9810	Y	N	Privet	Ligustrum sp.	16	Retain and Protect	
6	9811	N	N	English Walnut	Juglans regia	14	Retain and Protect	
7	9813	N	N	Japanese Flowering Plum	Prunus cerasifera	11	Remove	
8	9813	Y	Y	California Bay Laurel	Umbellularia californica	13	Retain and Protect	
9	9814	N	N	California Bay Laurel	Umbellularia californica	12	Remove	
10	9815	N	N	California Bay Laurel	Umbellularia californica	11	Retain and Protect	
11	9816	Y	N	Sweet Gum Tree	Liquidambar styraciflua	44	Retain and Protect	
12	9834	N	N	Sweet Gum Tree	Liquidambar styraciflua	6.5	Retain and Protect	

TREES SHOWN ARE EXISTING. SEE LANDSCAPE PLANS FOR TREES TO BE REMOVED AND TO REMAIN.

* SHOWN IS THE PROPOSED DRAWINGS, SEE THE AS-BUILT SHEETS AND TOPO MAP FOR THE EXISTING CONDITION

SITE PLAN NOTES:
1. CONTRACTOR SHALL COORDINATE WITH APPROPRIATE DEPARTMENT FOR REMOVAL, RELOCATION, AND RECONNECTING OF EXISTING UTILITIES, ALL TO BE VERIFIED IN FIELD.
2. A SEPARATE PERMIT IS REQUIRED FOR WORK TO BE DONE IN THE PUBLIC RIGHT OF WAYS.
3. ALL ROOF DRAINAGE FROM DOWNSPOUTS SHALL BE CONNECTED INTO A CLOSED PIPE DRAINAGE SYSTEM THAT GOES TO THE FRONT YARD TO BUBBLE UPS
4. EXTERIOR SURFACES TO SLOPED AWAY FROM THE RESIDENCE FOUNDATION AT 5% MINIMUM FOR LANDSCAPE AREAS AND AT 2 % MINIMUM FOR PAVED AREAS

* SEE CIVIL AND LANDSCAPE SHEETS FOR INFORMATION NOT SHOWN HERE

SITE PLAN | SCALE: 1/8"=1'-0" | 1

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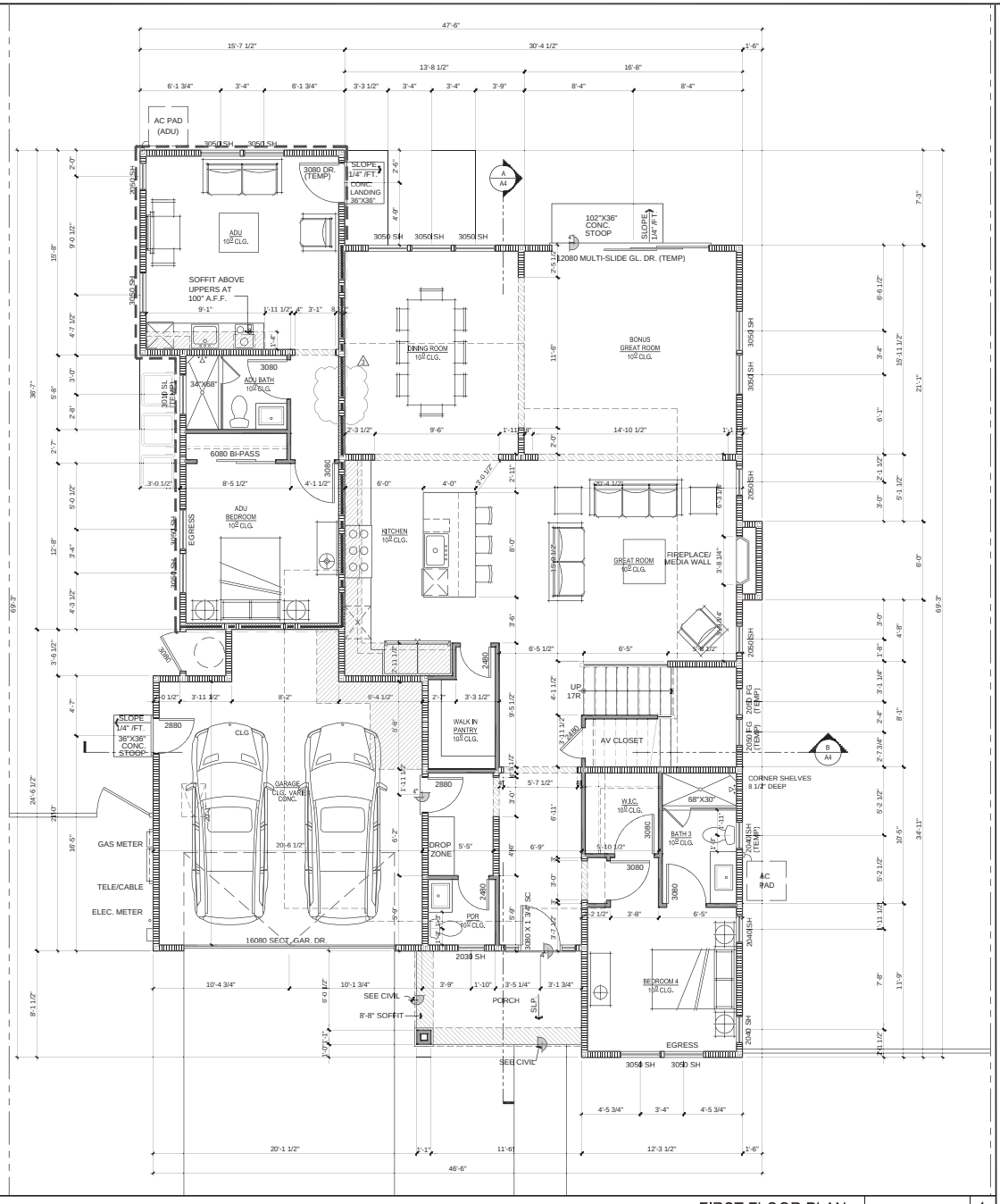
SITE PLAN

A1



FIRST FLOOR PLAN | SCALE : 1/4" = 1'-0" | 1

Floor Plan Summary:
(Bonus Great Room)
(Extended Dining Room)
Main House:
4 Bedrooms
3.5 Baths
2715.55 s.f. Living
ADU
1 Bed
1 Bath
488.99 s.f.
3204.54 s.f. Total

Zoning: R-1-S (FG) ⚠

Lot Coverage:
Lot Size: 9019.00 s.f.
Coverage Max.: 35%
9019.00 x .35 = 3156.65 s.f. Max.
Provided: 2205.68 (24%)
(Excludes ADU - Includes Porch, Fireplace)

⚠
FAL Requirement:
Lot Size: 9019.00 s.f.
FAL Max.: 2800+.20(Lot-7000)
2800.00 + .25(9019-7000) = 3,203.8 s.f. Max.
(Excludes ADU, Fireplace, Porch, Stair Volume - Includes Garage)

FAL Provided:
1st Floor: 1630.06 s.f.
Garage: 476.96 s.f.
Subtotal: 2107.02 s.f.
2nd Floor: 1062.18 s.f.
Total: 3169.20 s.f.

Second Floor Requirement:
50% of Max. FAL Allowed
3316.00 x .50 = 1658.00 s.f. Max.
Provided: 1062.18 s.f.

FLOOR AREA	
FIRST FLOOR	1630 S.F.
SECOND FLOOR	1085 S.F.
TOTAL	2715 S.F.
ADU:	489 S.F.
GARAGE	477 S.F.
FRONT PORCH	90 S.F.

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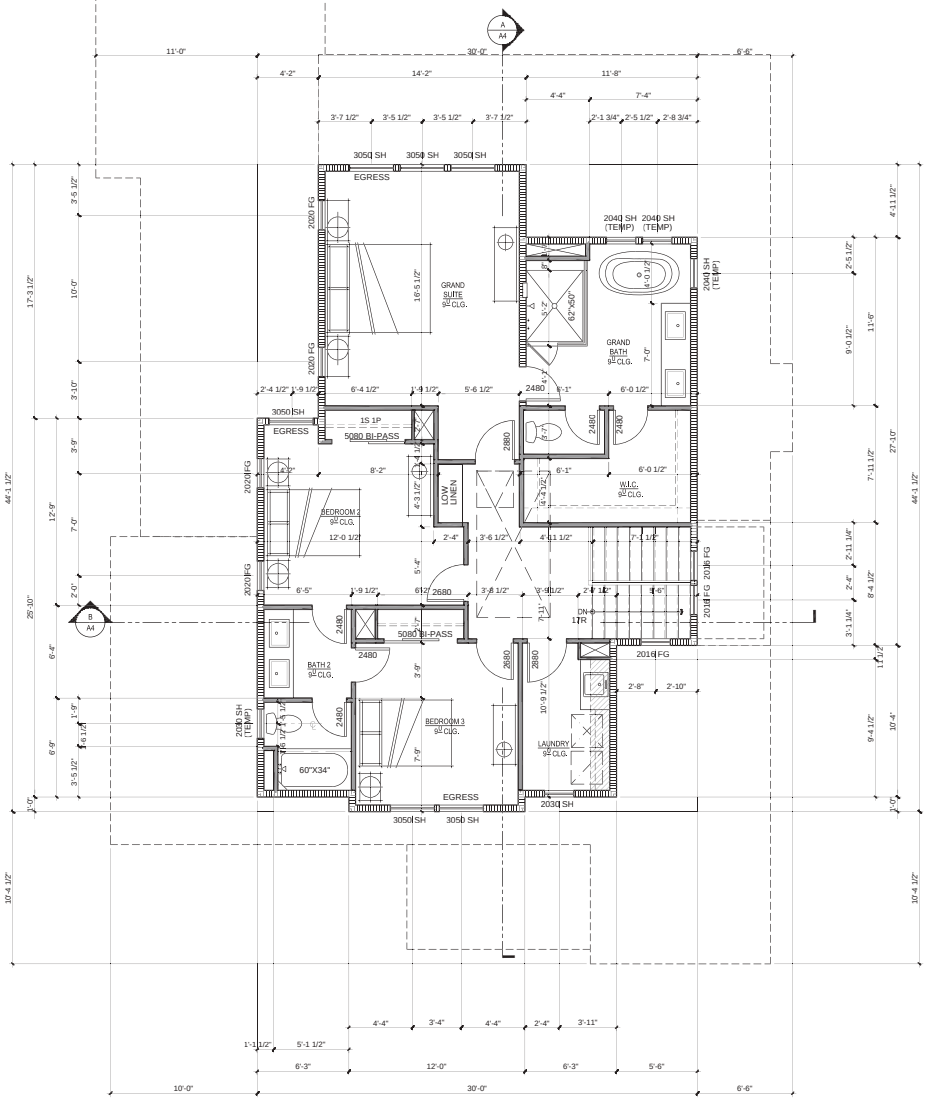
FIRST
FLOOR PLAN

A2



SECOND FLOOR PLAN | SCALE : 1/4" = 1'-0" | 1

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SECOND
FLOOR PLAN

A2.1

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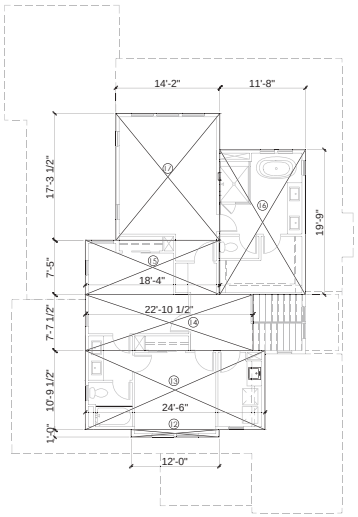
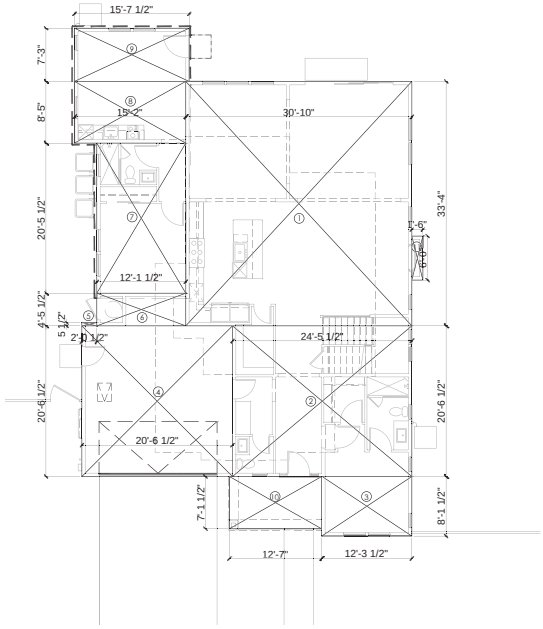


BLOCK CALCS:

HOUSE - 2ND FLOOR

12. 12'-0" x 1'-0"	=	12.00 SQ.FT.
13. 24'-6" x 10'-9.5"	=	264.40 SQ.FT.
14. 22'-10.5" x 7'-7.5"	=	174.42 SQ.FT.
15. 18'-4" x 7'-5"	=	135.97 SQ.FT.
16. 11'-8" x 19'-9"	=	230.42 SQ.FT.
17. 14'-2" x 17'-3.5"	=	244.97 SQ.FT.
2ND FLOOR TOTAL	=	1062.18 SQ. FT.

SECOND FLOOR PLAN | SCALE : 1/8" = 1'-0" | 2



BLOCK CALCS:

HOUSE - 1ST FLOOR

1. 30'-10" x 33'-4"	=	1027.78 SQ. FT.
2. 24'-5.5" x 20'-6.5"	=	502.41 SQ. FT.
3. 12'-3.5" x 8'-1.5"	=	99.87 SQ. FT.
TOTAL	=	1630.06 SQ. FT.

GARAGE

4. 20'-6.5" x 20'-6.5"	=	421.96 SQ. FT.
5. 2'-0.5" x 0'-5.5"	=	0.94 SQ. FT.
6. 12'-1.5" x 4'-5.5"	=	54.06 SQ. FT.
TOTAL	=	476.96 SQ. FT.
1ST FLOOR TOTAL	=	2107.02 SQ. FT.

ADU

7. 12'-1.5" x 20'-5.5"	=	248.06 SQ. FT.
8. 15'-2" x 8'-5"	=	127.65 SQ. FT.
9. 15'-7.5" x 7'-3"	=	113.28 SQ. FT.
TOTAL	=	488.99 SQ. FT.

PORCH & MISC.

10. 12'-7" x 7'-1.5"	=	89.66 SQ. FT.
11. 1'-6" x 6'-0"	=	9.00 SQ.FT.
TOTAL	=	98.66 SQ. FT.

FAL:

MAXIMUM TOTAL FLOOR AREA: 2,800 + .20x[9,019 (LOT SIZE) -7,000] = 3,203.8 SQ. FT. (INCLUDES GARAGE)
PROPOSED TOTAL FLOOR AREA: 1630.06 (1ST FLOOR) + 476.96 (GARAGE) + 1062.18 (2ND FLOOR) = 3169.2 SQ. FT.

ADU FLOOR AREA = 488.99 SQ.FT.

LOT COVERAGE:

MAXIMUM BLDG. COVERAGE:
35% Max. (9,019 X .35 = 3,156.65 SQ. FT.)

PROPOSED BLDG. COVERAGE (EXCLUDES ADU - INCLUDES 1ST FLOOR LIVING, GARAGE, PORCH, FP):
1630.06 (1ST FL.) + 476.96 (GARAGE) + 98.66 (PORCH & MISC.) = 2205.68 SQ. FT. / 9,019 SQ. FT. = 24.45 %

NOTE:
FAL BASED ON PLANNING REQUIREMENTS OF CALCULATIONS

FIRST FLOOR PLAN | SCALE : 1/8" = 1'-0" | 1

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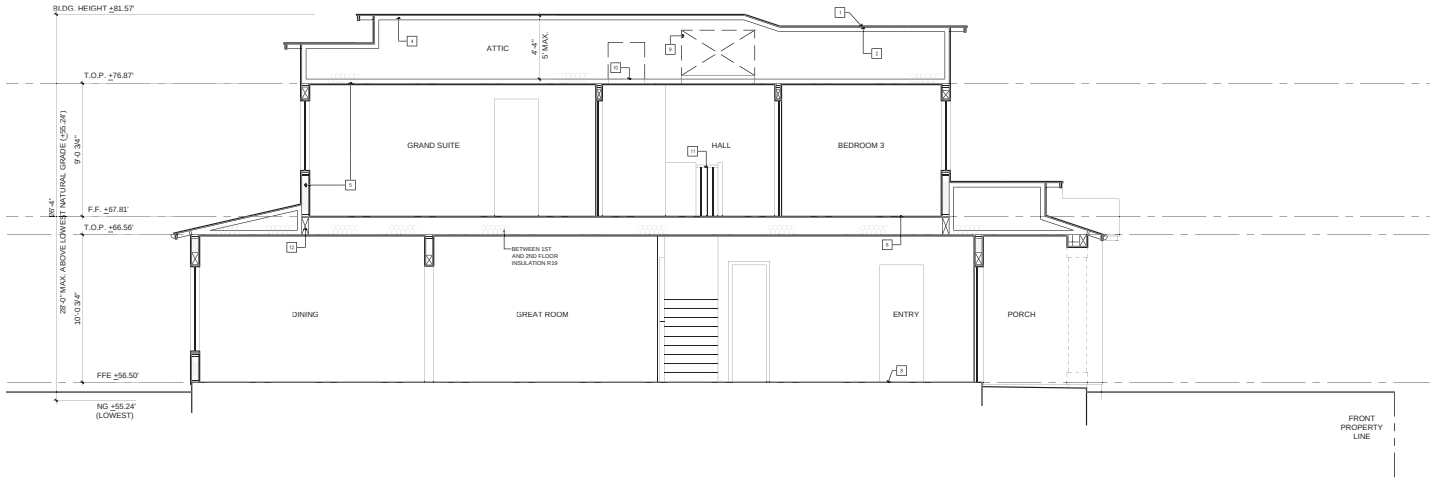
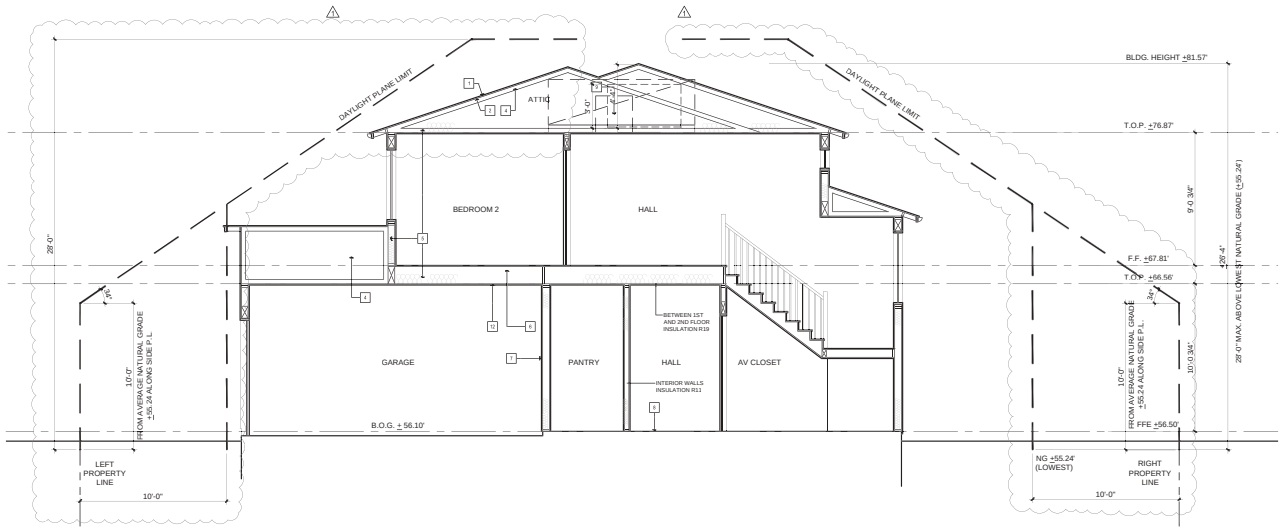
SQUARE FOOTAGE/
LOT COVERAGE

A2.2



SECTION A | SCALE : 1/4"=1'-0" | A



SECTION B | SCALE : 1/4"=1'-0" | B

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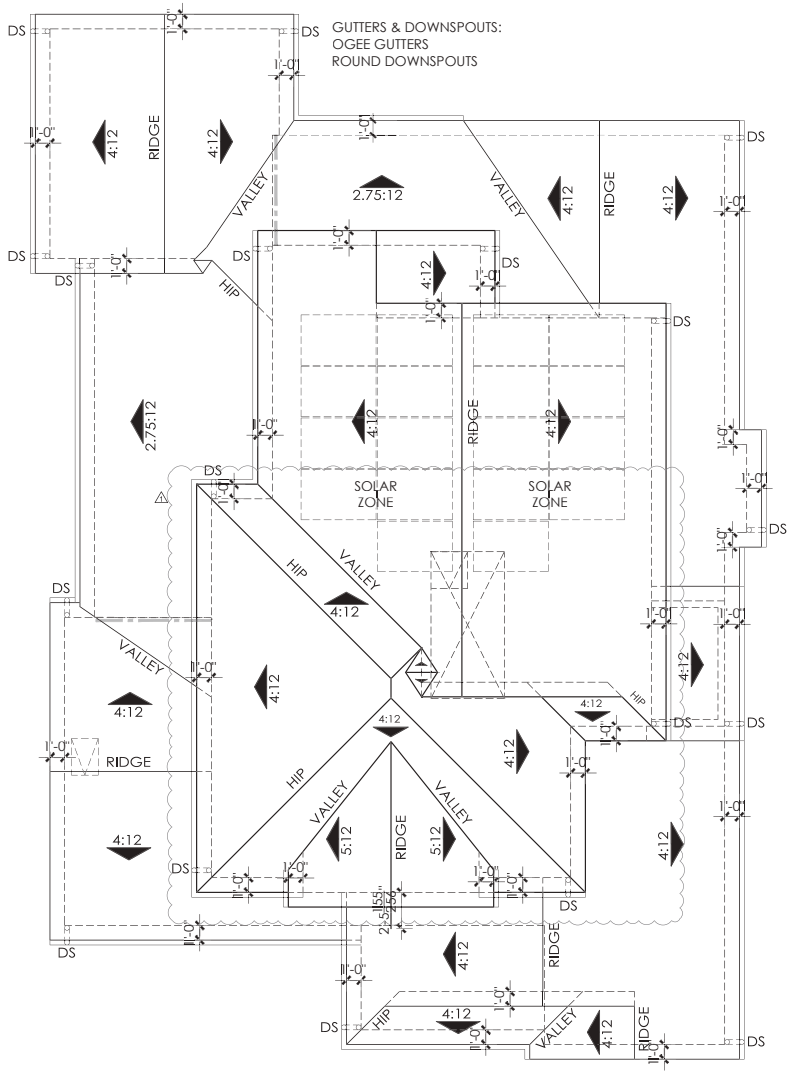
SECTIONS

A4



ROOF PLAN

OVERHANG : 12"
RAKE : 12"
ROOF PITCH : 4:12 U.N.O

ROOF PLAN | SCALE : 1/4" = 1'-0" | 1

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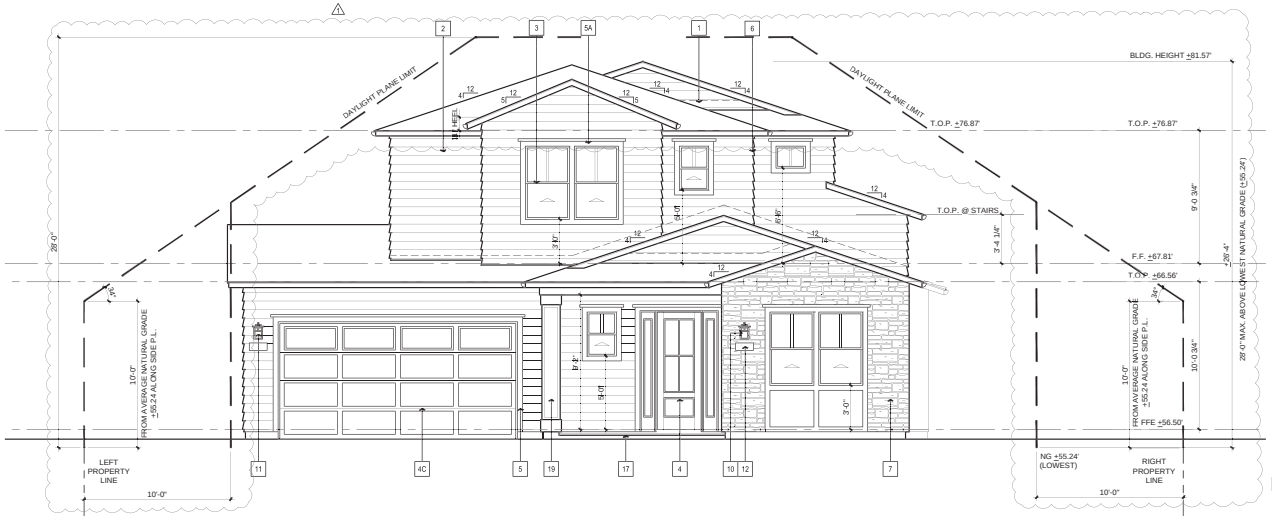
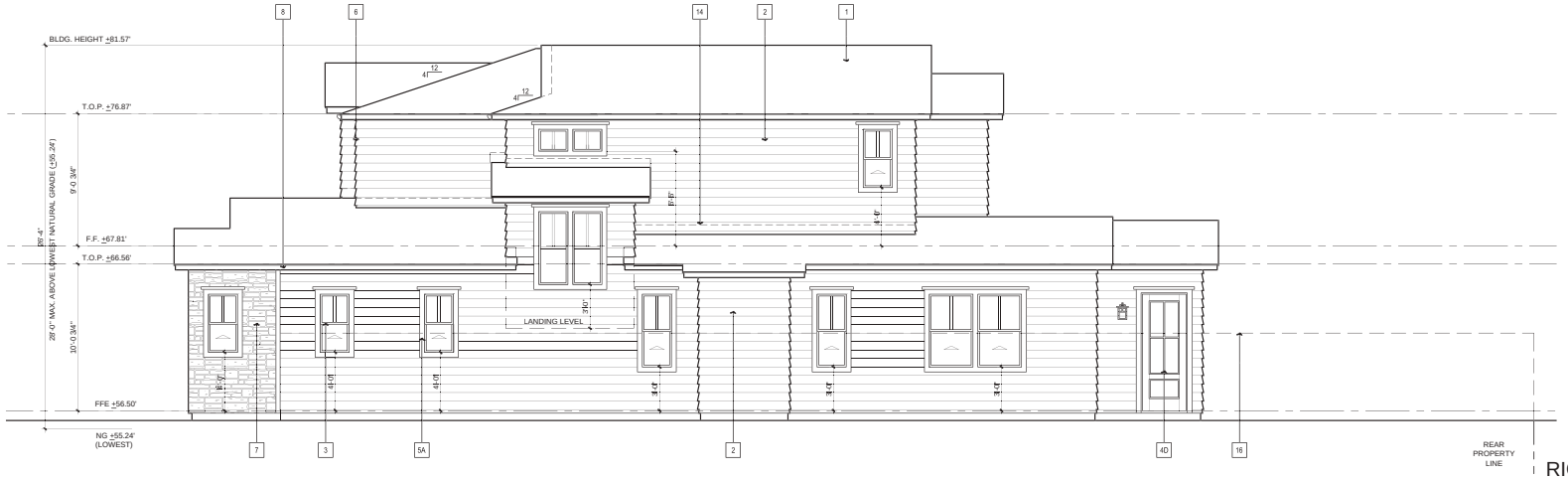
ROOF PLAN

A5



FRONT



RIGHT

EXT. ELEVATIONS | SCALE : 1/4" = 1'-0" | 1

KEYNOTES

1. ROOF : GAF COMPOSITION TIMBERLINE HD SHINGLES ROOFING O/ 2 LAYERS UNDERLAYMENT O/ ROOF SHTG. - GAF WEATHERWATCH AT HIPS, RIDGES, AND VALLEY. 26GA VALLEY METAL FLASHING. GRACE ICE AND WATER SHIELDS AT CRICKETS. SEE BUILDER'S SPEC
2. EXT. HORIZ. LAP SIDING: "HARDIE" CEMENT FIBER LAP SIDING - HARDIEPLANK LAP NER-405 - SMOOTH -PAINTED - STANDARD 7" EXPOSURE (8.25WIDE) - AT GABLE 5" EXPOSURE (6.25 WIDE) - SEE DETAILS
3. WINDOW: FRAME WINDOWS - ANDERSEN 100 SERIES FIBEREX
4. ENTRY DOOR: FIBERGLASS DOOR - SEE ELEVATION
4A. SIDE DOOR: FIBERGLASS EXT. SC. FLUSH - SEE BUILDER'S SPEC.
4B. REAR DOOR: 3 PANEL SLIDING GLASS DOORS - ANDERSEN HERITAGE
4C. GARAGE DOOR: SEE ELEVATION - 25 Ga. INSULATED STEEL GARAGE DOOR CLOPAY OR EQUIVALENT
4D. ADU ENTRY DOOR
4E. LOUVERED WATER HEATER CLOSET DOOR
5. DOOR TRIM, HEAD & JAMB: FIBER CEMENT TRIM 2"X4" TYP. U.O.N. SEE DETAIL
5A. WINDOW TRIM, SILL: 5/4" X 3 ½" FIBER CEMENT TRIM WITH 2X ON EDGE AT HEAD AND SILL (TYP.) SEE EXT. ELEVATIONS AND DET. (4 D3 SILL) (5 D3 JAMB) (6 D3 HEAD)
6. CORNER TRIM: WOODGRAIN ALUMINUM PRIMED CORNER MOULDING - 7 1/2" X 1 3/4"
7. ADHERED STONE VENEER OVER PLASTER BASE OVER (2) LAYERS GRADE 'D' MINIMUM BUILDING PAPER. INSTALL PER MANUFACTURE'S INSTRUCTIONS. VERIFY W/ COLOR SCHEME
8. FASCIA: 2X6 PREPRIMED WOOD
9. GUTTER AND DOWNSPOUT: PREFINISHED 5" FASCIA GUTTER WITH 3" DIA (1 3/4" X 2 3/4") PREFINISHED DOWNSPOUT, DISCHARGE PER CIVIL DRAWINGS
10. LIGHT FIXTURE: SEE ELECTRICAL PLAN & BUILDER'S SPEC.
11. LIGHT FIXTURE - GARAGE: WITH 24 HR PROGRAMMABLE SWITCH AND STANDARD ADDRESS NUMBER BELOW PER PRODUCT STANDARDS, EXTERIOR LIGHTING IS DARK SKY COMPLIANT CONSISTENT WITH CMC SECTION 13.102.040
12. PRIMARY ADDRESS NUMBER: VERTICALLY INSTALLED NUMBERS - ILLUMINATE BY LIGHT DIRECTLY OVERHEAD
13. NOT USED
14. FLASHING: GSM FLASHING AT ROOF TO WALL.
15. METER: ELECTRIC - PER PGE, PROVIDING SEPARATE METER FOR THE ADU
16. FENCE: SEE LANDSC. DWG.
17. CONC: CONC. PORCH FLOOR
18. CONC: CONC. STOOP
19. COLUMNS: CEMENTITIOUS (10 D4)
20. GAS METER: PER CIVIL
21. ELECTRIC WEATHER HEAD LOCATION

NOTE: ALL CORBEL TAILS TO BE PRIMED

ELEVATION NOTES

1. ALL VERTICAL DIMENSIONS SHOWN ARE FROM THE INTERIOR CONCRETE FLOOR SLAB AT THE FIRST FLOOR OR TOP OF SHEATHING AT THE UPPER FLOORS FLOOR.
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3. PROVIDE (2) LAYERS OF MIN. GRADE "D" BUILDING PAPER AT WOOD SHEATHED WALLS RECEIVING EXTERIOR PLASTER.
4. ALL HORIZONTAL SURFACES WILL RECEIVE BUILDING PAPER OVER HEAT RESISTANT SELF ADHERING, SELF SEALING FLASHING WEATHER BOARD LAPPED 6" MINIMUM WITH BUILDING PAPER PRIOR TO THE APPLICATION OF WIRE LATH AND PLASTER.
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7. COPPER METAL ROOFING, COPPER GRANULE-CONTAINING ASPHALT SHINGLES AND COPPER GUTTERS SHALL NOT BE PERMITTED FOR USE ON ANY RESIDENTIAL, COMMERCIAL OR INDUSTRIAL BUILDING FOR WHICH A BUILDING PERMIT IS REQUIRED. (CUPERTINO MUNICIPAL CODE SECTION 9.18.210)

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ktgy

The Leamington Building
1814 Franklin Street, Suite 400
Oakland, CA 94612
ktgy.com
510.272.2910

KTGY Project No: 2025-0703

Project Contact: Mohamed Eleraky
Email: meleraky@ktgy.com

Principal: Jill Williams
Project Designer: Amanda House

Developer

275 SHORELINE DR.
SUITE 400
REDWOOD CITY
CA. 94065
PHONE NO. (650) 980-8340
FAX NO.

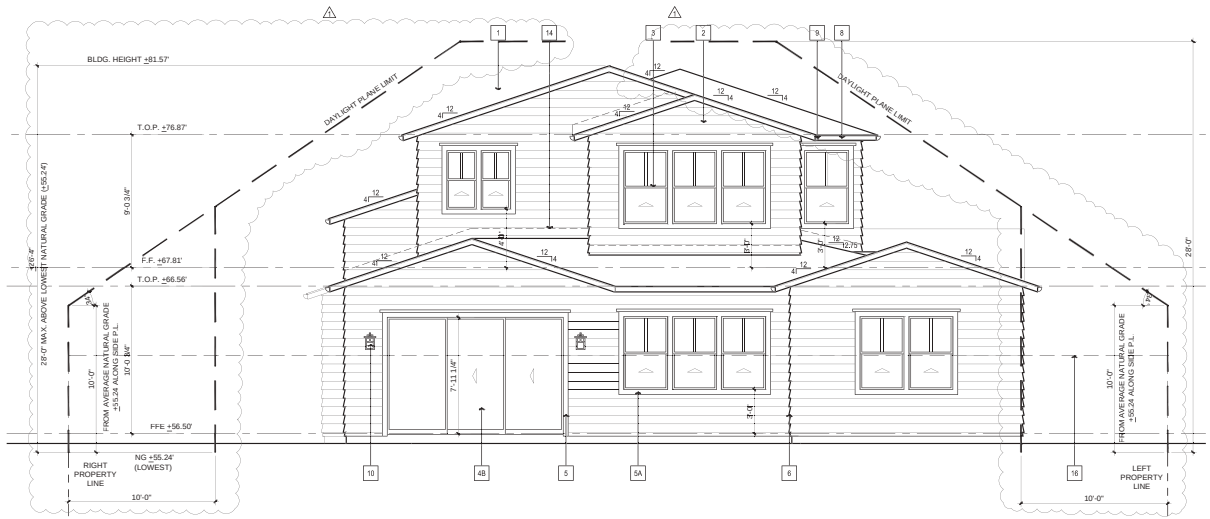
365 ARDEN ROAD
MENLO PARK, CA

No.	Date	Description
	08/26/2025	1ST PLANNING SUBMITTAL
⚠	11/10/2025	2ND PLANNING SUBMITTAL
	01/09/2026	3RD PLANNING SUBMITTAL
	02/19/2026	4TH PLANNING SUBMITTAL

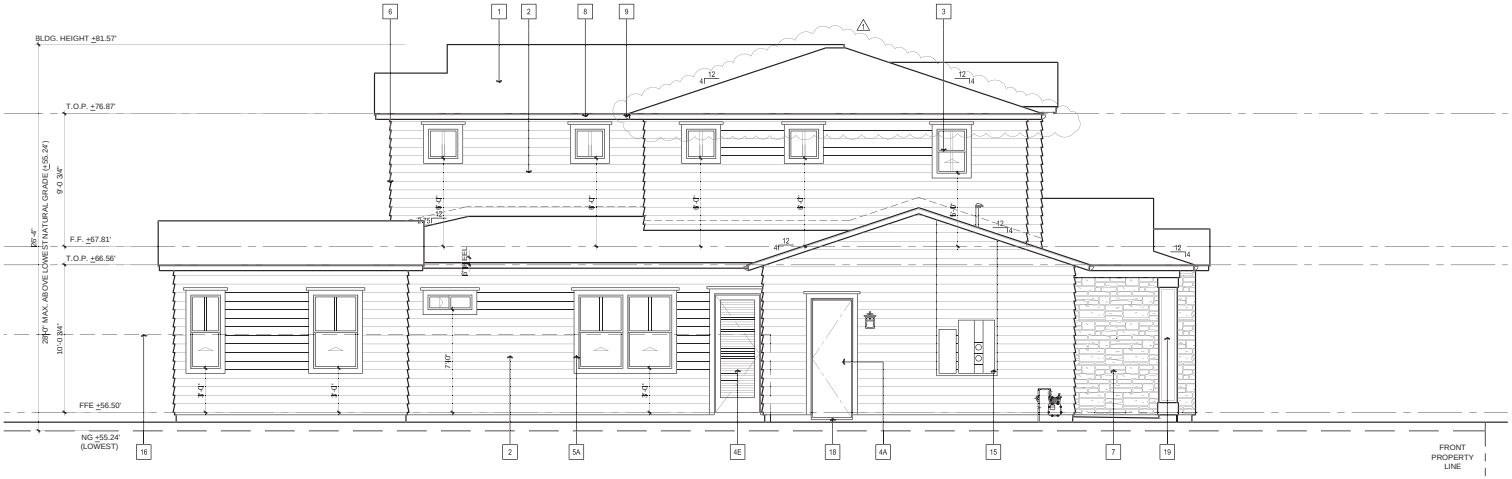
It is the clients responsibility prior to or during construction to notify the architect in writing of any perceived errors or omissions in the plans and specifications of which a contractor thoroughly knowledgeable with the building codes and methods of construction should reasonably be aware. Written instructions addressing such perceived errors or omissions shall be received from the architect prior to the client or clients subcontractors proceeding with the work. The client will be responsible for any defects in construction if these procedures are not followed.

EXTERIOR ELEVATIONS

A6



REAR



LEFT

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SCALE : 1/4" = 1'-0" | 1

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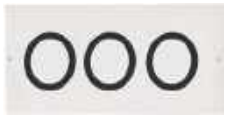
A7



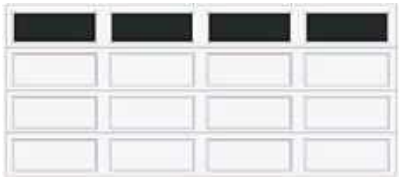
4" HOUSE NUMBERS
REPRESENTS MATERIALS ONLY, NUMBERS TO REFLECT PROPERTY ADDRESS



EXTERIOR LIGHT FIXTURE



FRONT DOOR
3/4 LITE 1 PANEL FIBERGLASS DOOR
FULL LITE FIBERGLASS SIDELITE
WITH SATIN ETCH GLASS



GARAGE DOOR
OVERHEAD GARAGE DOOR
WITH FROSTED GLASS WINDOWS
COLOR: WHITE

WINDOW FRAMES: WHITE





EXTERIOR RENDERINGS

TRADITIONAL - COLOR SCHEME 1

GOSSAMER VEIL
SW 9165
- SIDING

PURE WHITE
SW 7005
- DOOR AND WINDOW TRIMS
- WINDOW PANELING
- PORCH BEAMS AND COLUMN
- FASCIA, EAVES, AND GUTTERS
- GARAGE SIDE DOOR
- UTILITY DOOR

IRON ORE
SW 7069
- FRONT DOOR AND SIDELITES

ELDORADO STONE
TUNDRA BRICK - CHALK DUST
- GROUT: OBP GLACIER WHITE

GAF ROOF SHINGLES RS+
AGED CHESTNUT

FENCE STAIN
SEMI-SOLID
PEPPERWOOD

NOTES:
1. RENDERINGS SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY AND ARE NOT INTENDED TO BE AN ACTUAL DEPICTION OF THE HOME OR IT'S SURROUNDINGS.
2. ACTUAL COLORS, MATERIALS, AND FINISHES ARE SUBJECT TO VARIATION AND MAY DIFFER FROM THOSE SHOWN.
3. DOWNSPOUT COLOR TO FOLLOW TJH PRODUCT STANDARDS.

TJH

The Hackberry Plan
Traditional

365 Arden Road
Menlo Park, California 94025

This is an example of design specifications for this particular plan and elevation. Detailed specifications, finishes and fixtures are subject to change, on homes prior to sale, at any time without notice or obligation. Square footages and lot dimensions are approximate and may vary in construction and depending on the standard of measurement used, engineering and municipal requirements, or other site-specific conditions. Room size, walls, windows, doors, porches and balconies vary per home elevation and location. Not an offer or solicitation to sell real property. Thomas James Homes is a registered trademark of Thomas James Homes, LLC. ©2018 Thomas James Homes. All rights reserved. CA DRE license #02057367

Date *09/29/2025*

Designer *Calvin Ma*

Architect *KTGY*

COLOR BOARD
I-1.01

GENERAL NOTES

1. DRAWINGS
   The drawings are for information only. The Contractor shall check and verify all dimensions, and existing conditions including structures, surface and subsurface utilities, pavements, and landscaping at site prior to commencement of the work. Any discrepancies in drawings shall be brought to the attention of the Owner's Representative and Landscape Architect. No work shall proceed until a resolution has been agreed upon to the satisfaction of the Owner's Representative.
2. SITE ACCEPTANCE
   The Contractor shall review the project site to verify that conditions are suitable to receive work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function. Any discrepancies shall be brought to the attention of the Owner's Representative in writing. Commencement of work constitutes the Contractor's acceptance of the site conditions.
3. CODES AND ORDINANCES
   All work and materials shall be in full accordance with all applicable federal, state, and local laws or codes and the applicable requirements of all regulatory agencies.
4. UTILITIES
   Contact Common Ground Alliance (C.G.A.) at 811, at least two working days in advance of work (per CA GOV. CODE 4216). Protect existing features and utilities to remain during construction until final completion. If live utilities are encountered which were not indicated previously, protect the same from damage and immediately notify the owner's representative and affected utility provider. Do not proceed until further instructions are received from the owner's representative. The contractor is solely responsible and shall pay for repairs to damaged utilities due to the contractor's operations.
5. EXISTING CONSTRUCTION
   The project involves construction within existing infrastructure systems and adjacent to existing facilities which are to remain operational and accessible at all times. All existing construction to remain shall be protected. New work shall meet existing construction level, plumb, and consistent. Any existing construction damaged by Contractor shall be replaced at Contractor's expense. Any disturbed areas outside project limit of work are to be restored to original conditions at Contractor's expense.
6. CONSTRUCTION MEANS AND COORDINATION
   The Contractor:
   · Shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of work under the contract.
   · Shall supervise and direct the work, using the Contractor's best skill and attention.
   · Shall coordinate the location and installation of all site work.
   · Shall coordinate all trades. Any work that must be removed or relocated due to lack of coordination of the trades is solely the Contractor's responsibility. Lack of specific details shall not be an excuse for improper installation of any material, device, or system.
   · Shall maintain a secure site throughout the construction process.
7. LAYOUT NOTES
   Written dimensions take precedence over scaled dimensions. Dimensions indicated on plans for horizontal control are accurate if measured on a level line. Measure horizontal control dimensions on a level line, not parallel with ground slope. Dimensions are to face of finish unless otherwise noted. Where dimensions are noted to be verified in field (VIF) the dimension shown is the design basis but may differ from actual conditions. Contractor shall verify these dimensions while laying out the work and report any discrepancies between the design basis and actual dimensions to the owner's representative prior to proceeding with the work. Where dimensions are noted "+/-" field dimensions may vary from the noted dimensions by minor amounts.
8. VERTICAL CONSTRUCTION
   All vertical construction shall be installed true and plumb. All unit coursing, tops of walls, fences, and other vertical elements, shall be level unless otherwise noted. All curves shall be continuous and consistent tangential arcs, with no breaks or angles at points of tangency or formwork jointing.
9. FENCING
   Fence locations and heights shown are diagrammatic. Final locations and heights are to be coordinated in the field by the landscape contractor.

IRRIGATION NOTES

1. CODES AND ORDINANCES
   The irrigation system shall be installed in conformance with all applicable state and local codes and ordinances by licensed contractors and experienced workmen. Contractor shall obtain and pay for all required permits and fees relating to their work.
2. DIAGRAMMATIC PLANS
   This design is diagrammatic. All piping, valves, etc. shown within paved areas is for design clarification only and shall be installed in planting areas where possible. Avoid any conflicts between the sprinkler system, planting and architectural features. Parallel pipes may be installed in common trench. Pipes are not to be installed directly above one another. Valve locations shown are diagrammatic. Install in ground cover/shrub areas where possible (not in lawn area.)
3. ELECTRICAL CONNECTIONS
   Electrical contractor to supply 120 VAC (2.5 amp) GFCI Receptacle service to controller location. Irrigation contractor to make final connection from electrical stub-out to controller. Irrigation control wire shall be #16, U.L approved for direct burial. Common wire shall be #14 U.L. approved and shall be white in color. Wiring to individual remote control valves shall be color other than white.
4. FIELD OBSTRUCTIONS
   Do not willfully install the sprinkler system as shown on the drawings when it is obvious in the field that obstructions, grade differences or differences in the area dimensions exist that might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the owner's representative. If this notification is not performed, the irrigation Contractor shall assume full responsibility for any revisions necessary at no cost to the Owner. When vertical obstructions (street lights, trees, fire hydrants, etc.) interfere with the spray pattern of the heads so as to prevent proper coverage, the irrigation contractor shall field adjust the sprinkler system by installing a quarter, third, or half circle head at the sides of the obstruction so as to provide proper coverage. All adjustments shall be made at no additional cost to the Owner.
5. FIELD COORDINATION
   It is the responsibility of the irrigation Contractor to familiarize himself with all grade differences, location of walls, retaining walls, etc. The Contractor shall coordinate their work with the general Contractor and other Subcontractors for the location and the installation of pipe sleeves through walls, under paving, structures, etc. Contractor to verify the location of existing underground utilities and structures prior to the excavation of trenches. Contractor is to repair any damage caused by his work at no additional cost to the Owner.
6. FLOW AND OPERATING PRESSURE
   The sprinkler system design is based on a 50 psi minimum operating pressure. The irrigation Contractor shall verify water pressure prior to construction. Report any difference between the water pressure indicated on the drawings and the actual pressure reading at the irrigation point of connection to the Owner's Representative.
7. EXCAVATIONS AND TRENCHING
   All excavations are to be filled with compacted backfill. Contractor to repair all settled trenches promptly, for a period of 1 year after completion of work. Additionally, Contractor shall warrant that the irrigation system will be free from defects in materials and workmanship for a period of 1 year after final acceptance of work.
8. SLEEVING AND CONDUITS
   In addition to the sleeves and conduits shown on the drawings, the irrigation contractor shall be responsible for coordinating the installation of sleeves and conduits of sufficient size under all paved areas.
9. CONTROL WIRE CONNECTIONS
   Remote control valves shall be wired to controller in sequence as shown on plans. Run wire from each RCV to the controller. Splicing wires together outside of valve boxes will not be permitted. Splicing of 24-volt wires will not be permitted except in valve boxes. Leave a 36" coil of excess wire at each splice and 100 feet on center along wire run. Tape wire in bundles 10 feet on center. No taping permitted inside sleeves.
10. SPARE CONTROL WIRE
    Install two (2) spare control wire for every 6 (six) stations on the controller along the entire main line. Spare wires shall be the same color (one with a white stripe) and of a different color than other control wires. Loop 36" excess wire into each single valve box and into one valve box in each group of valves.
11. PRESSURE REGULATION AND FLUSHING
    The irrigation contractor shall adjust pressure regulating module at each valve to obtain the optimum operating pressure for each system. All main lines shall be flushed prior to the installation of irrigation dripline and bubblers. At 30 days after installation each system shall be flushed to eliminate glue and dirt particles from the lines.
12. IRRIGATION COVERAGE
    Notify Owner's Representative of any aspects of layout that will provide incomplete or insufficient water coverage of plant material and do not proceed until instructions are obtained.
13. SPRINKLER ORIENTATION
    All sprinkler heads shall be set perpendicular to finish grade of the area to be irrigated unless otherwise designated on the plans.
14. CHECK VALVES
    In locations where low head drainage will cause erosion and excess water, install King Bros. CV series check valves in lateral lines for every 5' of elevation change.

PLANTING NOTES

1. DRAWING CONFORMANCE
   All work shall conform to drawings and planting details. No deviations shall be accepted unless approved by the Owner's Representative.
2. SITE PREPARATION
   Remove all vegetation and deleterious materials not shown on plan for retention. Test on-site soils for horticultural suitability and amendments. Preserve all horticulturally suitable topsoil by stockpiling on site. Topsoil shall be replaced in planting areas to achieve final finish grades. Rip and till areas to receive topsoil on the same day topsoil is relocated.
3. DRAINAGE
   All softscapes and hardscapes shall slope to drain away from buildings towards drainage appurtenances at a rate of .5% minimum to 1% maximum, unless otherwise noted.
4. WORK IN RIGHT OF WAY
   Any work conducted within the right of way or to be maintained by local jurisdictional agencies shall be installed per the latest edition of the agency construction standards, and all other agency requirements.
5. UTILITY CLEARANCE
   For all trees, a 5' minimum clearance shall be maintained from all water, electric and sanitary sewer utility lines. A 10' minimum clearance shall be maintained from all overhead utilities. All planting except low-growing groundcover shall be 3' clear of all fire appurtenances per NFPA 18.5.7
6. SOIL TESTING
   Contractor shall submit soil samples to a certified soil testing laboratory for the determination of soil suitability and amendments. Contractor shall amend soils per the recommendations provided in the soil analysis report at the rates prescribed by the soil testing laboratory. All tree planting pits shall be backfilled with amended planting soil per the soil analysis report. Contractor shall submit a copy of the soil analysis report to the Landscape Architect for review of compliance with Water Efficient Landscape Ordinance.
7. PLANT STANDARDS
   All plant material shall comply with ANSI Z60.1 "Standard For Nursery Stock," notes, and details on the drawings.
8. SUBSTITUTIONS
   Planting substitutions, if necessary, shall be submitted to the Landscape Architect for approval. Any substitutions made without the approval of the Landscape Architect shall be rejected. Substitutions shall be made at no additional cost to the owner.
9. TREE PLANTING
   All planting pits shall be bermed to allow for appropriate drainage. In soils with slow percolation rates, planting pits shall be augured 12" dia. X 8' depth and filled with drain rock to prevent ponding. All planting pits shall drain completely within a time frame of 2 hours.
10. ROOT BARRIERS
    Root control barriers shall be utilized at any sidewalks, curbs, or hardscapes that are within 5 feet of trees. Root barrier panels shall be 18" deep and span 10' feet to each side of the centerline of the tree.
11. LAWN INSTALLATION
    - Rototill or spade the area to a depth of 4 to 6 inches. Rake and smooth the soil, removing rocks, roots, and large clods
    - Ensure proper soil compaction of no more than 85% relative density.
    - Roll the area lightly with a lawn roller 1/3 full of water, maintaining the finish grade of soil 1 inch below adjacent paving.
    - Water the prepared area to settle the soil and provide a moist base for turf. Moisten the soil to a depth of 6 inches minimum.
    - Install turf immediately upon delivery. In hot weather, protect unlaid turf by placing stacks in shade, covering with moist burlap sacking, and/or sprinkling.
    - Begin installing turf along the longest straight line, such as a driveway or sidewalk. Butt and push edges and ends against each other tightly, without stretching. Avoid gaps or overlaps. Stagger the joints in each row in a brick-like fashion at a minimum overlap of 2'. Avoid leaving small strips at outer edges as they will not retain moisture. On slopes, place the turf pieces across the slope.
    - Begin watering turf within 30 minutes of installation. To avoid causing indentations or air pockets, avoid repeated walking or kneeling on the turf while it is being installed or just after watering.
    - After installation, roll the entire area to improve turf/soil contact and remove air pockets.
12. MULCHING
    A minimum 3-inch layer of mulch shall be applied on all exposed soil surfaces of planting areas except turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated. Contractor shall submit a sample of proposed mulch material to Landscape Architect for review. All areas to receive mulch shall be treated with an organic pre-emergent herbicide to control weed growth.
13. CERTIFICATE OF COMPLETION
    A Certificate of Completion shall be certified by the Landscape Contractor upon completion and final review of landscape installation and provided to the Owner's Representative for submittal to the local governing jurisdiction.
14. ESTABLISHMENT PERIOD
    The establishment period shall be a minimum of 60 calendar days commencing upon written verification of substantial completion by the Owner's Representative. Contractor shall observe and maintain planting material to ensure planting material is acclimatized and displays healthy and vigorous growth. Any planting in need of replacement shall trigger an additional establishment period of 60 calendar days commencing on the date of replacement.

SITE CALCULATIONS (PERVIOUS/IMPERVIOUS)

	SF	% OF SETBACK AREA	% OF LOT AREA
365 ARDEN ROAD			
TOTAL SITE AREA	9020		100%
FRONT SETBACK AREA	1501	100%	17%
PERVIOUS AREA	994	66%	
IMPERVIOUS AREA	508	34%	
TOTAL SITE PERVIOUS AREA	5057		56%
LANDSCAPE AREAS	4303		48%
LAWN AREA	754		8%
TOTAL SITE IMPERVIOUS AREA	3963		44%
BUIDLING FOOTPRINTS	2605		66%
EXTERIOR SURFACES (CONC., D.G., PORCHES)	1358		34%

WATER USE CALCULATIONS

(ETo): 49.7

Zone	Plant Type	Plant Factor (PF)	Irrigation Method	Irr. Efficiency (IE)	ETAF (PF/IE)	Landscape Area (sq ft)	ETAF x Area	(ETWU)
Regular Landscape Areas								
A1	Shrubs	0.2	Drip	0.81	0.247	44	11	332
A1	Shrubs	0.2	Drip	0.81	0.247	40	10	304
A1	Shrubs	0.2	Drip	0.81	0.247	324	80	2,462
A2	Shrubs	0.2	Drip	0.81	0.247	755	186	5,743
A3	Shrubs	0.5	Drip	0.81	0.617	236	146	4,495
A4	Shrubs	0.2	Drip	0.81	0.247	483	119	3,673
A4	Shrubs	0.2	Drip	0.81	0.247	100	25	762
A4	Shrubs	0.2	Drip	0.81	0.247	35	9	266
A5	Shrubs	0.2	Drip	0.81	0.247	600	148	4,565
A6	Turf Grass	0.9	Overhead Spray	0.75	1.2	754	905	27,893
A7	Trees	0.5	Drip	0.81	0.617	9	6	171
A7	Trees	0.5	Drip	0.81	0.617	9	6	171
A7	Trees	0.5	Drip	0.81	0.617	9	6	171
A7	Trees	0.5	Drip	0.81	0.617	9	6	171
A7	Trees	0.5	Drip	0.81	0.617	9	6	171
MULCH AREA	Other	0	Non-Irrigated	1	0	763	0	0
MULCH AREA	Other	0	Non-Irrigated	1	0	516	0	0
MULCH AREA	Other	0	Non-Irrigated	1	0	46	0	0
MULCH AREA	Other	0	Non-Irrigated	1	0	309	0	0
MULCH AREA	Other	0	Non-Irrigated	1	0	763	0	0
MULCH AREA	Other	0	Non-Irrigated	1	0	84	0	0
					Totals:	5,896	1,666	51,349
Special Landscape Areas								
					Totals:	0	0	0

ETWU Total: 51,349 gal/yr
MAWA: 127,183 gal/yr

ETAF Calculations

Regular Landscape Areas	
Total ETAF x Area	1,666
Total Area:	5,896
Average ETAF*:	0.28
All Landscape Areas	
Total ETAF x Area	1,666
Total Area:	5,896
Sitewide ETAF:	0.28

I HAVE COMPLIED WITH THE CRITERIA OF THE WATER CONSERVATION IN LANDSCAPE ORDINANCE AND HAVE APPLIED THEM FOR THE EFFICIENT USE OF WATER IN THE LANDSCAPE AND IRRIGATION DESIGN.

JORGE DANIEL ABICH, PLA (CA #5899)

* = Average ETAF for Regular Landscape Areas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.

LANDSCAPE DESIGN PLAN NOTES (TITLE 23, CHAPTER 2.7, §492.6)

1. A MINIMUM 3-INCH LAYER OF MULCH SHALL BE APPLIED ON ALL EXPOSED SOIL SURFACES OF PLANTING AREAS EXCEPT TURF AREAS, CREEPING OR ROOTING GROUNDCOVERS, OR DIRECT SEEDING APPLICATIONS WHERE MULCH IS CONTRAINDICATED.

SKETCH & FIELD
Landscape Architecture | Exterior Design
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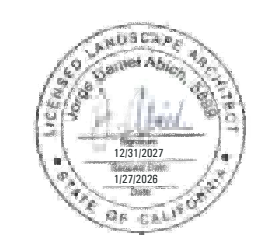
(510) 905-7444

Project Title:

LANDSCAPE IMPROVEMENTS

365 ARDEN ROAD
MENLO PARK, CA 94025

Stamp:



Date | No. | Revision Notes

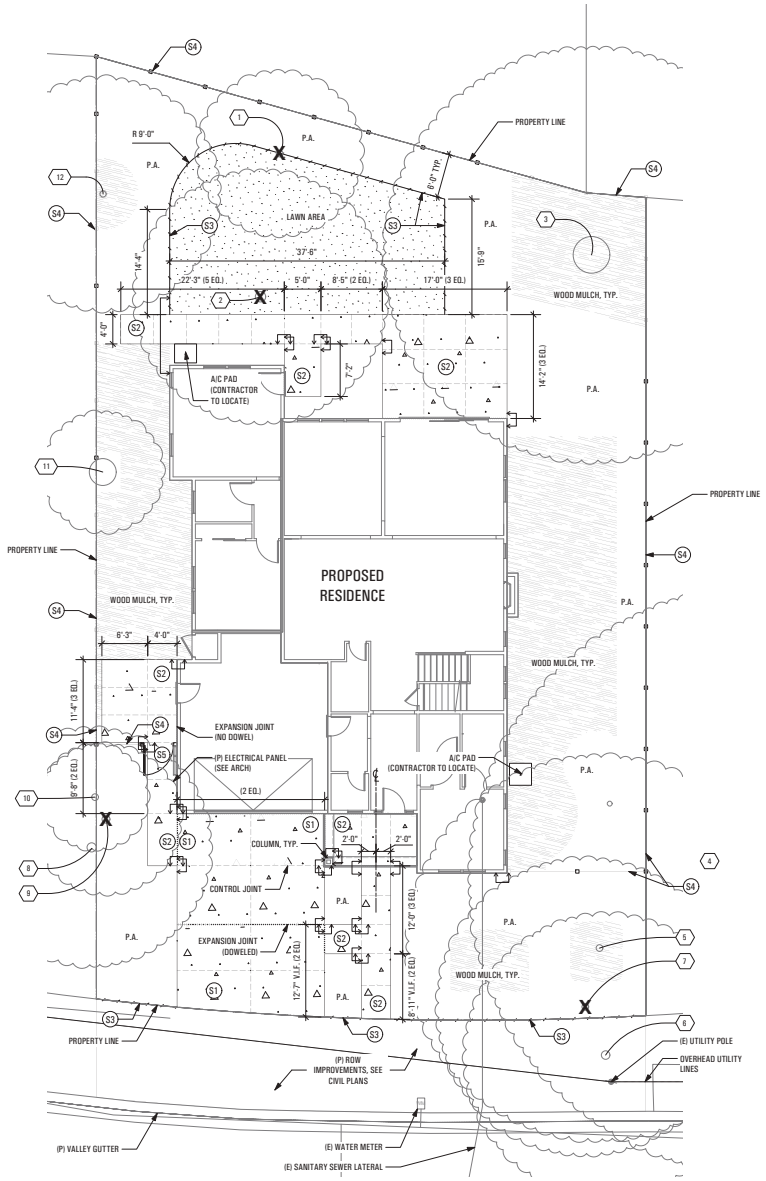
Issue Note: PERMIT SET	Project ID: 2507-03
Drawn By: D1	Reviewed By: P1
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title

NOTES AND CALCULATIONS

Sheet No.

L1.0



LAYOUT LEGEND

- VIEW NUMBER / SHEET NUMBER — DETAIL CALLOUT
- DIMENSION
- CENTERLINE
- ALIGN
- CONTROL JOINT
- EXPANSION JOINT (DOWELED)
- EXPANSION JOINT (NO DOWEL)
- (E) TREE TO REMAIN, TYP.
- (E) TREE TO BE REMOVED, TYP.
- (E) TREE TO BE RELOCATED, TYP.

MATERIALS LEGEND

- S1 — 1/L1.2 — VEHICULAR CONCRETE PAVEMENT
  STANDARD GRAY CONCRETE WITH ACID ETCH FINISH
  TOP CAST #01 SURFACE RETARDANT MANUFACTURED BY GRACE PRODUCTS. TOOLED SCORE JOINTS AS SHOWN ON PLANS.
- S2 — 2/L1.2 — CONCRETE PAVEMENT
  STANDARD GRAY CONCRETE WITH ACID ETCH FINISH
  TOP CAST #01 SURFACE RETARDANT MANUFACTURED BY GRACE PRODUCTS. TOOLED SCORE JOINTS AS SHOWN ON PLANS.
- S3 — 3/L1.2 — METAL HEADER
  3/16" THK. X 4" MIN. STEEL HEADER, BLACK ENAMEL FINISH
  16" LONG STEEL STAKES
- S4 — 4/L1.2 — 6'-0" HIGH WOOD FENCE
- S5 — 5/L1.2 — GATE

ABBREVIATIONS

ABV.	ABOVE	F.T.	FLUSH TREAD	PVMT.	PAVEMENT
A.C.	ASPHALT CONCRETE	HORIZ.	HORIZONTAL	R.	RADIUS
ADJ.	ADJACENT	HT.	HEIGHT	REQ'D.	REQUIRED
AVG.	AVERAGE	JT.	JOINT(S)	R.O.W.	RIGHT OF WAY
C.L.	CENTER LINE	MAX.	MAXIMUM	RS.	RISER
C.P.	CENTER POINT	MECH.	MECHANICAL	SIM.	SIMILAR
CLR.	CLEAR	MFG.	MANUFACTURER	SP.	SPACES
CONC.	CONCRETE	MIN.	MINIMUM	T.B.D.	TO BE DETERMINED
(E)	EXISTING	(N)	NEW	TR.	TREAD
E.W.	EACH WAY	N.I.C.	NOT IN CONTRACT	TYP.	TYPICAL
EQ.	EQUAL SPACES	O.C.	ON CENTER	U.	UNIT(S)
EQPT.	EQUIPMENT	(P)	PROPOSED	VERT.	VERTICAL
F.G.	FINISH GRADE	P.A.	PLANTING AREA	V.I.F.	VERIFY IN FIELD
F.S.	FINISH SURFACE	P.O.B.	POINT OF BEGINNING		

Keynote	Tag #	Heritage	Offsite	Common Name	Botanical Name	DBH (inches)	Status	Note
1	5606	N	N	Laurel	Laurus sp.	11	Remove	
2	5607	Y	N	Blackwood Acacia	Acacia melanoxylon	17	Remove	
3	5608	Y	N	Coast Redwood	Sequioa sempervirens	61	Retain and Protect	
4	5609	Y	Y	London Planetree	Platanus x hispanica	20	Retain and Protect	
5	5610	Y	N	Privet	Ligustrum sp.	16	Retain and Protect	
6	5611	N	N	English Walnut	Juglans regia	14	Retain and Protect	
7	5612	N	N	Japanese Cheesewood	Pittosporum tobira	11	Remove	
8	5613	Y	Y	California Bay Laurel	Umbellularia californica	15	Retain and Protect	
9	5614	N	N	California Bay Laurel	Umbellularia californica	13	Remove	
10	5615	N	N	California Bay Laurel	Umbellularia californica	11	Retain and Protect	
11	5616	Y	N	Coast Live Oak	Quercus agrifolia	44	Retain and Protect	
12	5054	N	N	Coast Live Oak	Quercus agrifolia	6.5	Retain and Protect	

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JORGE DANIEL ABICH, PLA (CA #5899)

SEE SHEET L1.2 FOR CONSTRUCTION DETAILS

SCALE: 1/8" = 1'-0" (0 4 8 12 16 20 FT)

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Project Title:
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365 ARDEN ROAD
MENLO PARK, CA 94025

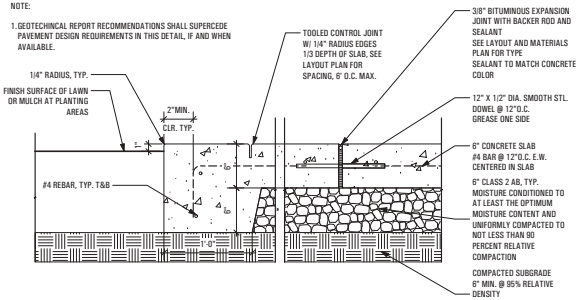
Stamp:

Date	No.	Revision Notes

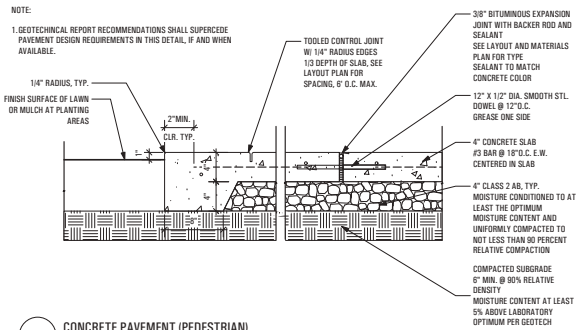
Issue Status: PERMIT SET	Project ID: 2507-03
Drawn By: DI	Reviewed By: PI
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title:
LAYOUT AND MATERIALS PLAN

Sheet No.:
L1.1



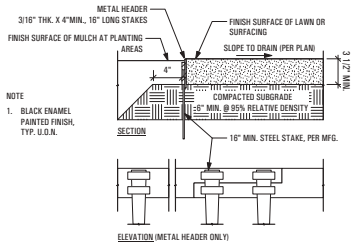
1 CONCRETE PAVEMENT (VEHICULAR)
Scale: 1 1/2" = 1'-0"



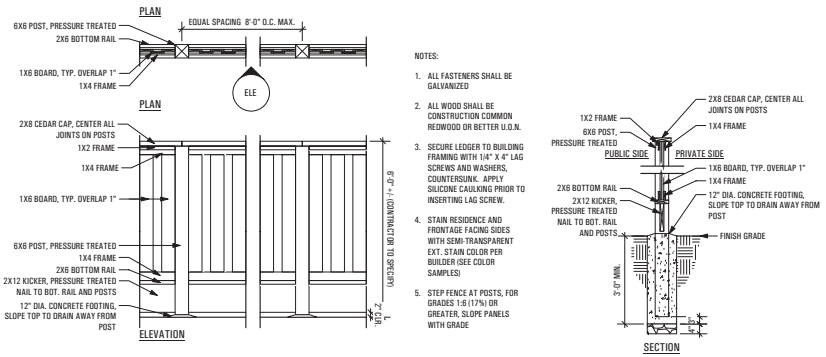
2 CONCRETE PAVEMENT (PEDESTRIAN)
Scale: 1 1/2" = 1'-0"

ARBORIST TREE PROTECTION GENERAL GUIDELINES

1. The Project Arborist for this project is California Tree & Landscape Consulting. Contact the Project Arborist at (530) 745-4086. The project arborist may continue to provide expertise and make additional recommendations during the construction process if and when additional impacts occur or tree response is poor. Monitoring and construction oversight by the project arborist is recommended for all projects and required when a final letter of assessment is required by the jurisdiction.
2. The Project Arborist should inspect the exclusionary root protection fencing installed by the contractor prior to any grading and/or grubbing for compliance with the recommended protection zones. Additionally, the project arborist shall inspect the fencing at the onset of each phase of construction. The protection zone for trees is specified as the 'canopy radius' in Appendix 2 unless otherwise specified in the preservation requirements. The location of the tree protection fencing shall be depicted on the plans pursuant to the arborist recommendations. Note 'dripline' is not an acceptable location for installation of tree protection fencing.
3. The Project Arborist should directly supervise any clearance pruning, irrigation, fertilization, placement of mulch and/or chemical treatments. If clearance pruning is required, the Project Arborist should approve the extent of foliage elevation and oversee the pruning to be performed by a contractor who is an ISA Certified Arborist. Clearance pruning should include removal of all the lower foliage that may interfere with equipment PRIOR to having grading or other equipment on site.
4. Clearly designate an area on the site outside the drip line of all trees where construction materials may be stored, and parking can take place. No materials or parking shall take place within the root zones of protected trees.
5. Any and all work to be performed inside the protected root zone fencing, including all grading and utility trenching, shall be approved and/or supervised by the Project Arborist.
6. Trenching, if required, inside the protected root zone shall be approved and/or supervised by the Project Arborist and may be required to be by a hydraulic or air spade, placing pipes underneath the roots, or boring deeper trenches underneath the roots.

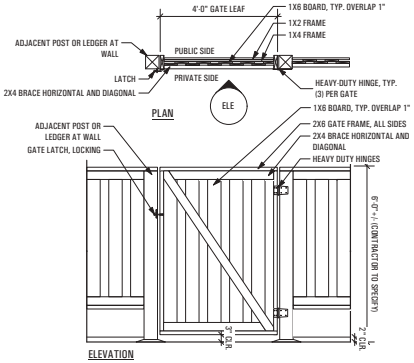


3 METAL HEADER
Scale: 1 1/2" = 1'-0"



NOTES:
1. ALL FASTENERS SHALL BE GALVANIZED
2. ALL WOOD SHALL BE CONSTRUCTION COMMON REDWOOD OR BETTER U.O.N.
3. SECURE LEDGER TO BUILDING FRAMING WITH 1/4" X 4" LAG SCREWS AND WASHERS, COUNTERSUNK. APPLY SILICONE CAULKING PRIOR TO INSERTING LAG SCREW.
4. STAIN RESIDENCE AND FRONTAGE FACING SIDES WITH SEMI-TRANSPARENT EXT. STAIN COLOR PER BUILDER (SEE COLOR SAMPLES)
5. STEP FENCE AT POSTS, FOR GRADES 1:8 (17%) OR GREATER, SLOPE PANELS WITH GRADE

4 BOARD ON BOARD FENCE
Scale: 1/2" = 1'-0"



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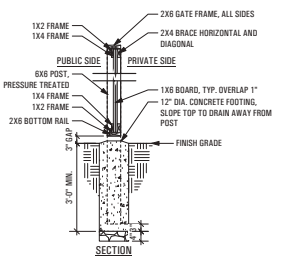

5 BOARD ON BOARD GATE
Scale: 1/2" = 1'-0"

REPRESENTATIVE STAIN COLORS



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Project Title
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365 ARDEN ROAD
MENLO PARK, CA 94025

Stamp

Date No. Revision Notes

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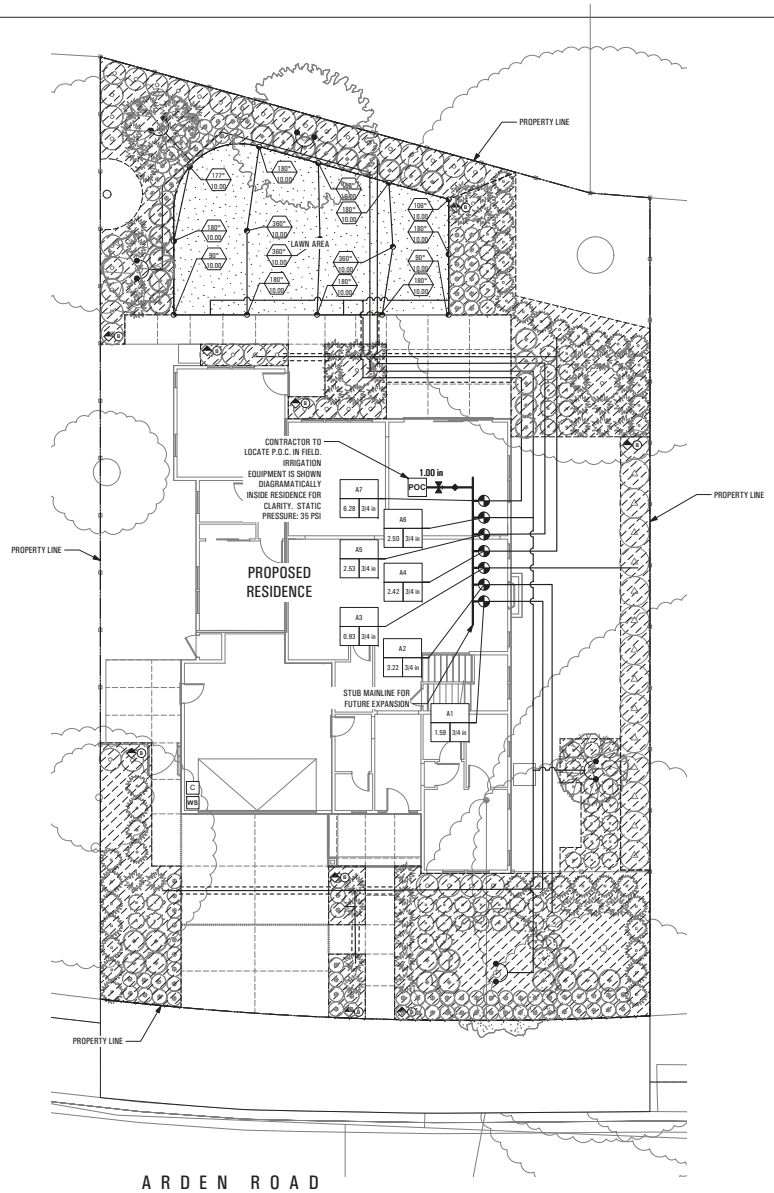
Drawn By: DI	Reviewed By: PI
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title
CONSTRUCTION DETAILS

Sheet No.
L1.2



IRRIGATION LEGEND

CONTROLLER

Symbol	Manufacturer	Series	Model	Quantity	Note
C	Hunter Industries(R)	Pro-HC	PHC-1200	1	Locate controller as directed by builder. Controller shown at approximate location only. Coordinate with builder for all required penetrations and 120v power. 12 station controller.

VALVES

Symbol	Manufacturer	Series	Model	Type	Zone ID	Size	Design Flow	Note (*)
	Toro(R)	EZ-Flo(R) Plus Jar-Top Series	EZF-29-03	Control / Zone	A1	0.75	1.59	F Series Y Filter and 40PSI Pressure Regulator
	Toro(R)	EZ-Flo(R) Plus Jar-Top Series	EZF-29-03	Control / Zone	A2	0.75	3.22	F Series Y Filter and 40PSI Pressure Regulator
	Toro(R)	EZ-Flo(R) Plus Jar-Top Series	EZF-29-03	Control / Zone	A3	0.75	0.93	F Series Y Filter and 40PSI Pressure Regulator
	Toro(R)	EZ-Flo(R) Plus Jar-Top Series	EZF-29-03	Control / Zone	A4	0.75	2.42	F Series Y Filter and 40PSI Pressure Regulator
	Toro(R)	EZ-Flo(R) Plus Jar-Top Series	EZF-29-03	Control / Zone	A5	0.75	2.35	F Series Y Filter and 40PSI Pressure Regulator
	Toro(R)	EZ-Flo(R) Plus Jar-Top Series	EZF-29-03	Control / Zone	A6	0.75	2.50	F Series Y Filter and 40PSI Pressure Regulator
	Toro(R)	EZ-Flo(R) Plus Jar-Top Series	EZF-29-03	Control / Zone	A7	0.75	5.32	F Series Y Filter and 40PSI Pressure Regulator
	Nibco	Gate Valves	T-113	Isolation / Shut Off		1	0.00	

SYSTEM COMPONENTS

Symbol	Manufacturer	Series	Model	Type	Qty	Note
WS	Hunter Industries(R)	Rain Sensor	WR-CLIK(R)	Environmental Sensor / Station	1	Place on gutter in inconspicuous area.
	Hunter Industries(R)	HC Flow Meter	HC-075-Flow	Flow Sensor	1	Per Detail 5/L2.2
	Toro	Loc-Eze Flush Valve	T-FCH-H-PIPT	Blow Out Connection	9	Per Detail 10/L2.2
	Hunter(R)	Eco-Illndicator	ECO-ID	Other	9	Per Detail 12/L2.2

IRRIGATION SPRAY AND BUBBLER HEADS

Symbol	Manufacturer	Series (Body)	Model	Series (Nozzles)	Model	Quantity	Pattern	Arc	Radius
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-360	3	Radial	360°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	1	Radial	90°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	2	Radial	180°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	1	Radial	106°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	1	Radial	180°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	1	Radial	180°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	1	Radial	90°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	1	Radial	180°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	1	Radial	180°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	2	Radial	180°	10'0"
	Hunter Industries(R)	Pro-Spray	PROS-06	MP Rotator(R)	MP1000-90	1	Radial	177°	10'0"
	Rain Bird(R)	1/2 in MPT Adapter 17 mm barb	(560-M50	Bubbler	1401	10	Radial	360°	2'0"

DRIP LINE

Symbol	Manufacturer	Series	Model	Area	Row Spacing	Estimated Length	Note
	Toro(R)	DL2000(TM) Series	RGP-218	2684 sq ft	1'6"	1789'11"	Triangulate Emitters

MAINLINE AND LATERAL PIPING

SLEEVE
MAINLINE
LATERAL
POLYETHYLENE TUBING

Type	Diameter	Total Length
PVC Schedule 80	1	38'3 3/8"
PVC Schedule 40	1	852'10 3/8"
Polyethylene Tubing	1/2	42'11 3/8"

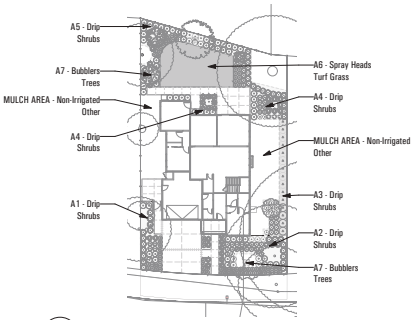
TAG/LABEL LEGEND

STATION NAME
FLOW (GPM)
VALVE SIZE
SPRAY ANGLE
SPRAY RADIUS

HYDROZONE TABLE

ID	METHOD	PLANT TYPE	AREA
A1	Drip	Shrubs	407 sq ft
A2	Drip	Shrubs	755 sq ft
A3	Drip	Shrubs	236 sq ft
A4	Drip	Shrubs	618 sq ft
A5	Drip	Shrubs	600 sq ft
A6	Spray Heads	Turf Grass	754 sq ft
A7	Bubblers	Trees	45 sq ft
MULCH AREA	Non-Irrigated	Other	2481 sq ft

SEE SHEET L1.0 FOR WELO CALCULATIONS



1 HYDROZONE AREAS
Scale: 1" = 30'-0"

REQUIRED STATEMENTS AND CERTFICATIONS (TITLE 23, CHAPTER 2.7, §492.6, §492.7 and §492.9)

1. A DIAGRAM OF THE IRRIGATION PLAN SHOWING HYDROZONES SHALL BE KEPT WITH THE IRRIGATION CONTROLLER FOR SUBSEQUENT MANAGEMENT PURPOSES.
2. A CERTIFICATE OF COMPLETION SHALL BE FILLED OUT AND CERTIFIED BY EITHER THE DESIGNER OF THE LANDSCAPE PLANS, IRRIGATION PLANS, OR THE LICENSED LANDSCAPE CONTRACTOR FOR THE PROJECT.
3. AN IRRIGATION AUDIT REPORT SHALL BE COMPLETED AT THE TIME OF FINAL INSPECTION.

IRRIGATION NOTES (TITLE 23, CHAPTER 2.7, §492.7)

1. PRESSURE REGULATING DEVICES ARE REQUIRED IF WATER PRESSURE IS BELOW OR EXCEEDS THE RECOMMENDED PRESSURE OF THE SPECIFIED IRRIGATION DEVICES.
2. CHECK VALVES OR ANTI-DRAIN VALVES ARE REQUIRED ON ALL SPRINKLER HEADS WHERE LOW POINT DRAINAGE COULD OCCUR.

I HAVE COMPLIED WITH THE CRITERIA OF THE WATER CONSERVATION IN LANDSCAPE ORDINANCE AND HAVE APPLIED THEM FOR THE EFFICIENT USE OF WATER IN THE LANDSCAPE AND IRRIGATION DESIGN.

JORGE DANIEL ABICH, PLA (CA #5899)

SEE SHEET L2.2 FOR IRRIGATION DETAILS

SCALE: 1/8" = 1'-0" 0 4 8 12 16 20 FT

TJH
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Project Title
LANDSCAPE IMPROVEMENTS
365 ARDEN ROAD
MENLO PARK, CA 94025

Stamp
LICENSED LANDSCAPE ARCHITECT
JORGE DANIEL ABICH, ROAD
Registration 12/31/2027
Renewal Date 1/27/2026
Date
STATE OF CALIFORNIA

Date	No.	Revision Notes

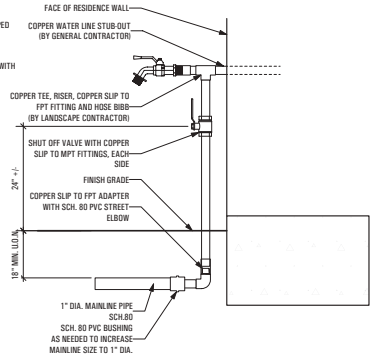
Issue Status: PERMIT SET	Project ID: 2507-03
Drawn By: D1	Reviewed By: P1
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title
IRRIGATION PLAN

Sheet No.
L2.1

POINT OF CONNECTION NOTES:

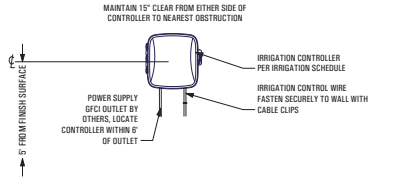
1. ALL THREADED CONNECTIONS TO BE WRAPPED WITH PTFE WHITE TEFLON TAPE. 2 FULL WRAPS MIN. CLOCKWISE DIRECTION.
2. COORDINATE PIPE WRAPPING OR PAINTING WITH GENERAL CONTRACTOR.



13 IRRIGATION POINT OF CONNECTION
SCALE: NTS

CONTROLLER NOTES:

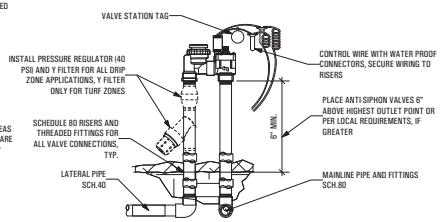
1. FOLLOW NEC AND ALL LOCAL REQUIREMENTS FOR ASSOCIATED ELECTRICAL WORK.
2. VERIFY THE LOCATION AND CLEARANCES TO CONTROLLER WITH GENERAL CONTRACTOR PRIOR TO INSTALLATION.
3. PROVIDE A CLEARLY WRITTEN SCHEDULE WITH CONTROLLER STATION ASSIGNMENTS ON MANUFACTURER PROVIDED SCHEDULE CARD. PLACE SCHEDULE AND PRODUCT LITERATURE IN WEATHER PROOF ZIPLOC STYLE BAG. COORDINATE STORAGE OF THESE MATERIALS WITH GENERAL CONTRACTOR.



15 WALL MOUNT IRRIGATION CONTROLLER
SCALE: NTS

VALVE NOTES:

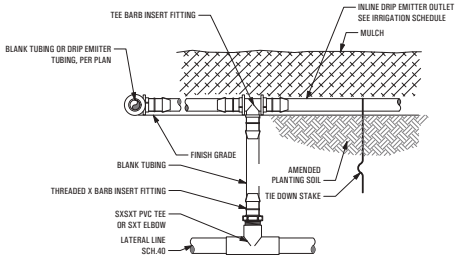
1. ALL THREADED CONNECTIONS TO BE WRAPPED WITH PTFE WHITE TEFLON TAPE. 2 FULL WRAPS MIN. CLOCKWISE DIRECTION.
2. COORDINATE VALVE STATION TAG WITH CONTROLLER STATION ASSIGNMENT PER CONTROLLER NOTES.
3. EXTEND MAINLINE 12" MIN. BEYOND LAST VALVE. CAP FOR FUTURE CONNECTION
4. VALVES ARE TO BE LOCATED IN AN INCONSPICUOUS LOCATION IN PLANTING AREAS OR BEHIND LANDSCAPE FEATURES. VALVES ARE TO BE ALIGNED ON CENTER AND SPACED 12" MIN. TO CENTERLINE OF EACH VALVE.



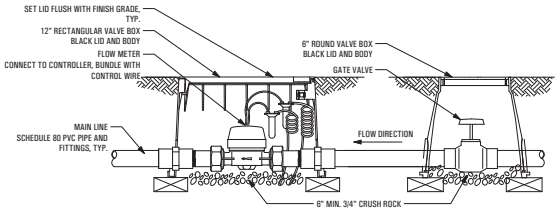
14 REMOTE CONTROL ANTI-SIPHON VALVE
SCALE: NTS

TIE DOWN NOTES

1. PLACE TIE DOWN STAKES EVERY THREE FEET IN SAND, FOUR FEET IN LOAM, AND FIVE FEET IN CLAY
2. AT FITTINGS WHERE THERE IS A CHANGE OF DIRECTION SUCH AS TEES OR ELBOWS, USE TIE DOWN STAKES ON EACH LEG OF THE CHANGE OF DIRECTION



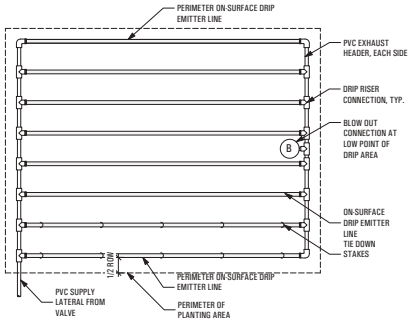
16 DRIP IRRIGATION RISER CONNECTION
SCALE: NTS



24 GATE VALVE AND FLOW METER
SCALE: NTS

DRIP LAYOUT NOTES:

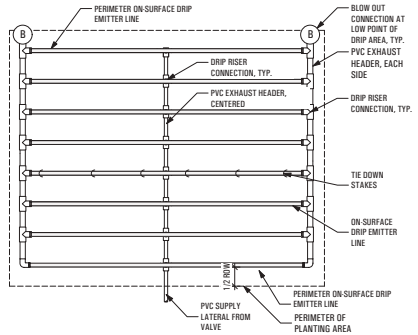
1. DISTANCE BETWEEN LATERAL ROWS AND EMITTER SPACING PER IRRIGATION SCHEDULE
2. LENGTH OF THE LONGEST DRIPLINE SHALL NOT EXCEED MANUFACTURER'S RECOMMENDATIONS



17 DRIP IRRIGATION END FEED LAYOUT
SCALE: NTS

DRIP LAYOUT NOTES

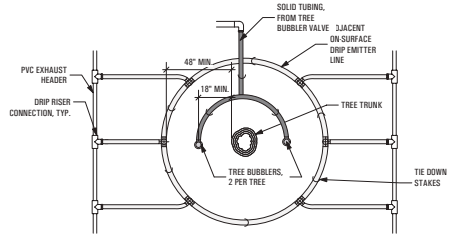
1. DISTANCE BETWEEN LATERAL ROWS AND EMITTER SPACING PER IRRIGATION SCHEDULE
2. LENGTH OF THE LONGEST DRIPLINE SHALL NOT EXCEED MANUFACTURER'S RECOMMENDATIONS



18 DRIP IRRIGATION CENTER FEED LAYOUT
SCALE: NTS

DRIP LAYOUT NOTES

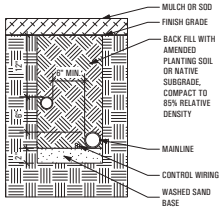
1. DISTANCE BETWEEN LATERAL ROWS AND EMITTER SPACING PER IRRIGATION SCHEDULE
2. LENGTH OF THE LONGEST DRIPLIne SHALL NOT EXCEED MANUFACTURER'S RECOMMENDATIONS
3. MAINTAIN 18" MIN. SPACING BETWEEN TREE TRUNK AND TREE BUBBLERS
4. MAINTAIN 48" MIN. SPACING BETWEEN TREE TRUNK AND ADJACENT SHRUB DRIP EMITTER LINE



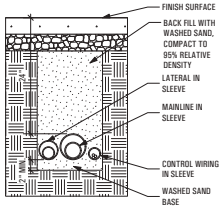
21 TREE BUBBLERS
SCALE: NTS

IRRIGATION TRENCHING NOTES:

1. INSTALL CONTROL WIRING WITHIN 4" OF MAINLINE BUT NOT DIRECTLY ABOVE MAINLINE.
2. DO NOT STACK PIPES. THREE PIPES MAXIMUM PER TRENCH.
3. EXTEND SLEEVES 12" BEYOND LIMIT OF PAVEMENTS.
4. INSTALL (1) ADDITIONAL SLEEVE FOR FUTURE EXPANSION AT ALL SLEEVE LOCATIONS.
5. SLEEVE DIAMETER TO BE 2X PIPE DIAMETER. 1 PIPE PER SLEEVE/WIRE BUNDLE.

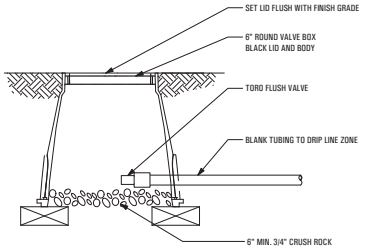


TRENCHING IN PLANTING AREAS



TRENCHING UNDER PAVEMENT

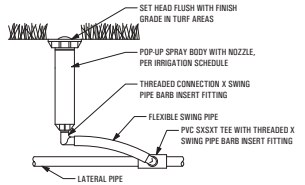
19 IRRIGATION TRENCHING
SCALE: NTS



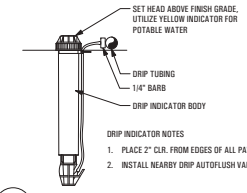
22 DRIP IRRIGATION AUTOFLUSH VALVE
SCALE: NTS

POP-UP SPRAY HEAD NOTES:

1. PLACE HEADS 2" CLR. FROM EDGES OF ALL PAVEMENTS.
2. DO NOT USE 'MARLEX' TYPE FITTINGS, ACETAL PLASTIC FITTINGS ARE ACCEPTABLE.
3. ALL THREADED CONNECTIONS TO BE WRAPPED WITH PTFE WHITE TEFLON TAPE. 2 FULL WRAPS MIN. CLOCKWISE DIRECTION.



20 POP-UP SPRAY HEAD
SCALE: NTS



DRIP INDICATOR NOTES

1. PLACE 2" CLR. FROM EDGES OF ALL PAVEMENTS.
2. INSTALL NEARBY DRIP AUTOFLUSH VALVE BOX

23 DRIP ZONE OPERATION INDICATOR
SCALE: NTS

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Project Title:

LANDSCAPE IMPROVEMENTS

365 ARDEN ROAD
MENLO PARK, CA 94025

Stamp:

Date | No. | Revision Notes

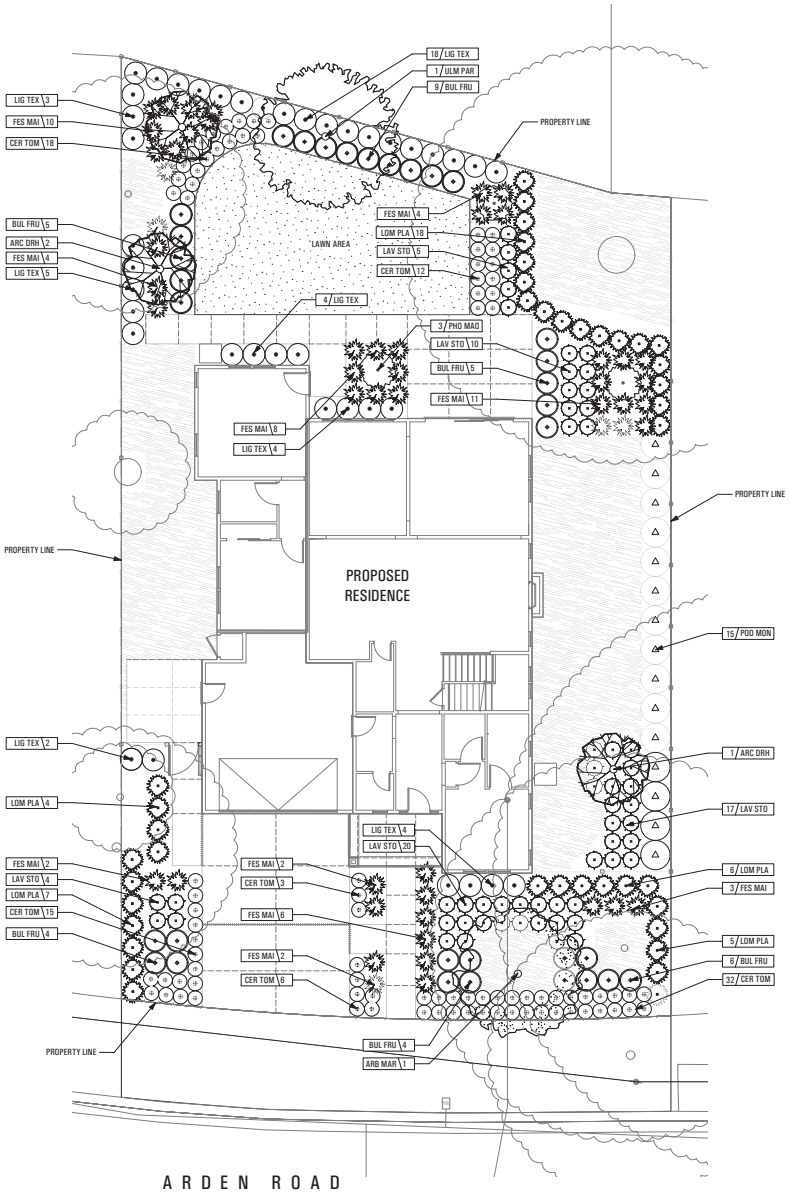
Issue Status: PERMIT SET	Project ID: 2507-03
Drawn By: D1	Reviewed By: P1
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title:

IRRIGATION DETAILS

Sheet No.:

L2.2



TREE LEGEND

KEY	ID	BOTANICAL NAME	COMMON NAME	QTY	CONT.	MATURE SPREAD	WUCOLS
	ARB MAR	Arbutus 'Marina'	Strawberry Tree	1	36"B	20 - 35 ft.	LOW
	ARC DRH	Arctostaphylos manzanita 'Dr. Hurd Dr. Hurd Manzanita		3	36"B	8 - 12 ft.	LOW
	ULM PAR	Ulmus parviflolia 'Drake'	Drake Chinese Elm	1	24"B	> 35 ft	LOW

PLANT LEGEND

KEY	ID	BOTANICAL NAME	COMMON NAME	SPACING	QTY	CONT.	WUCOLS
	BUL FRU	Bulbine frutescens 'Yellow'	Yellow Bulbine	36" O.C.	33	1G	LOW
	CER TOM	Cerastium tomentosum	Snow in Summer	24" O.C.	86	1G	LOW
	FES MAI	Festuca mairei	Atlas Fecue	36" O.C.	52	1G	LOW
	LAV STO	Lavandula stoechas 'Otto Quast'	Otto Quast Spanish Lavender	36" O.C.	56	5G	LOW
	LIG TEX	Ligustrum japonicum 'Texanum'	Waxleaf Privet	36" O.C.	40	15G	LOW
	LOM PLA	Lomandra 'Platinum Beauty'	Platinum Beauty Lomandra	36" O.C.	40	1G	LOW
	PHO MAO	Phormium 'Maori Chief'	Maori Chief New Zealand Flax	PER PLAN	3	15G	LOW
	POD MON	Podocarpus elongatus 'Monmal'	Icee Blue® Yellow-Wood	48" O.C.	15	15G	MOD

LAWN LEGEND

LAWN AREA	754 sq ft	90% Tall Fescue / 10% Kentucky Bluegrass

LANDSCAPE DESIGN PLAN NOTES (TITLE 23, CHAPTER 2.7, §492.6)

1. A MINIMUM 3-INCH LAYER OF MULCH SHALL BE APPLIED ON ALL EXPOSED SOIL SURFACES OF PLANTING AREAS EXCEPT TURF AREAS, CREEPING OR ROOTING GROUNDCOVERS, OR DIRECT SEEDING APPLICATIONS WHERE MULCH IS CONTRAINDICATED.
2. FOR SOILS LESS THAN 6% ORGANIC MATTER IN THE TOP 6 INCHES OF SOIL, COMPOST AT A RATE OF A MINIMUM OF FOUR CUBIC YARDS PER 1,000 SQUARE FEET OF PERMEABLE AREA SHALL BE INCORPORATED TO A DEPTH OF SIX INCHES INTO THE SOIL.

I HAVE COMPLIED WITH THE CRITERIA OF THE WATER CONSERVATION IN LANDSCAPE ORDINANCE AND HAVE APPLIED THEM FOR THE EFFICIENT USE OF WATER IN THE LANDSCAPE AND IRRIGATION DESIGN.

JORGE DANIEL ABICH, PLA (CA #5899)

SEE SHEET L3.2 FOR PLANTING DETAILS AND NOTES

SCALE: 1/8" = 1'-0"

0 4 8 12 16 20 FT

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Stamp:

LICENSED LANDSCAPE ARCHITECT
Jorge Daniel Abich, 5899
12/31/2027
Renewal Date
1/27/2026
Date
STATE OF CALIFORNIA

Date	No.	Revision Notes

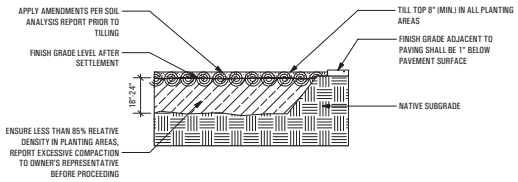
Issue Note: PERMIT SET	Project ID: 2507-03
Drawn By: D1	Reviewed By: P1
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title:

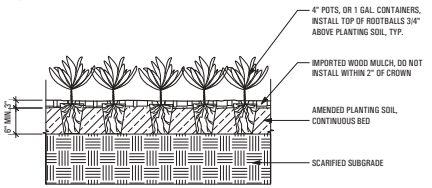
PLANTING PLAN

Sheet No.:

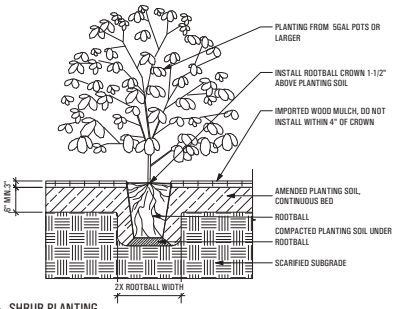
L3.1



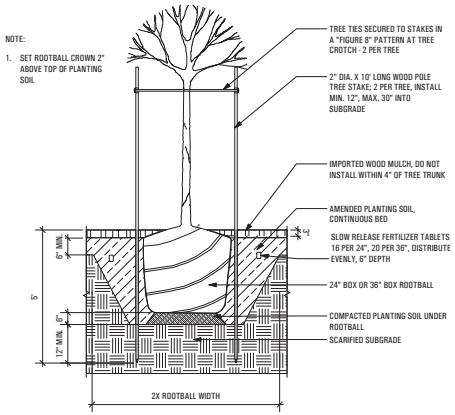
1 SOIL PREPARATION
SCALE: NTS



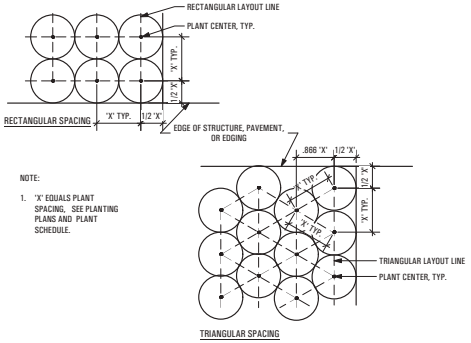
2 GROUNDCOVER PLANTING
SCALE: NTS



3 SHRUB PLANTING
SCALE: NTS



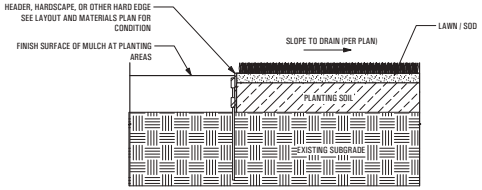
4 TREE PLANTING
SCALE: NTS



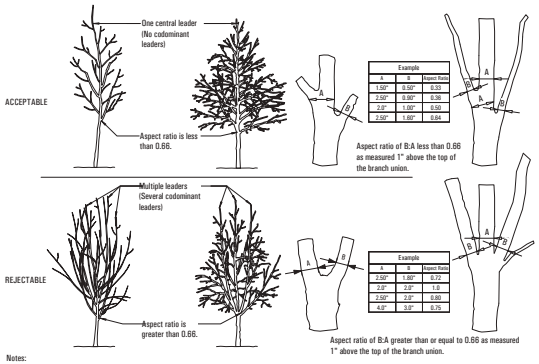
NOTE:
1. 'X' EQUALS PLANT SPACING, SEE PLANTING PLANS AND PLANT SCHEDULE.

5 PLANT SPACING
SCALE: NTS

NOTE
1. SEE PLANTING NOTES FOR ADDITIONAL INSTALLATION INSTRUCTIONS



8 LAWN
Scale: 2" = 1'-0"



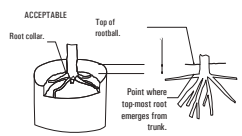
Example		
A	B	Aspect Ratio
1.50"	0.50"	0.33
2.50"	0.50"	0.20
2.0"	1.00"	0.50
2.50"	1.60"	0.64

Example		
A	B	Aspect Ratio
2.50"	1.80"	0.72
2.0"	2.0"	1.0
2.50"	2.0"	0.80
4.0"	3.0"	0.75

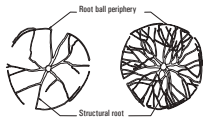
Notes:
1- Aspect ratio shall be less than 0.66 on all branch unions. Aspect ratio is the diameter of branch (B) divided by the diameter of the trunk (A) as measured 1" above the top of the branch union.

2- Any tree not meeting the crown observations detail may be rejected.

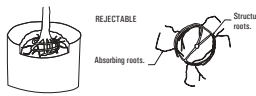
6 TREE BRANCHING STRUCTURE
SCALE: NTS



The point where top-most root(s) emerges from the trunk (root collar) should be within the top 2" of substrate. The root collar and the root ball interior should be free of defects including circling, kinked, ascending, and stem girdling roots. Structural roots shall reach the periphery near the top of the root ball.

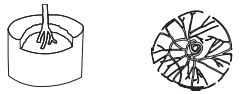


Roots radiate from trunk and reach side of root ball without deflecting down or around.



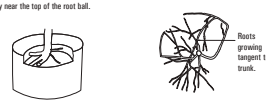
Structural roots circle interior of root ball. No structural roots are horizontal and reach the root ball periphery near the top of the root ball.

Only absorbing roots reach the periphery near the top of the root ball. Structural roots mostly wrap or are deflected on the root ball interior.



Structural roots descend into root ball interior. No structural roots are horizontal and reach the root ball periphery near the top of the root ball.

Structural roots circle and do not radiate from the trunk.



Structural roots primarily grow to one side.

Structural roots missing from one side, and/or grow tangent to trunk.

Notes:
1- Observations of roots shall occur prior to acceptance. Roots and substrate may be removed during the observation process; substrate/soil shall be replaced after observation has been completed.
2- Small roots (1/4" or less) that grow around, up, or down the root ball periphery are considered a normal condition in container production and are acceptable however they should be eliminated at the time of planting. Roots on the periperhy can be removed at the time of planting.
3- See specifications for observation process and requirements.

7 ROOT CONTAINER STRUCTURE
SCALE: NTS

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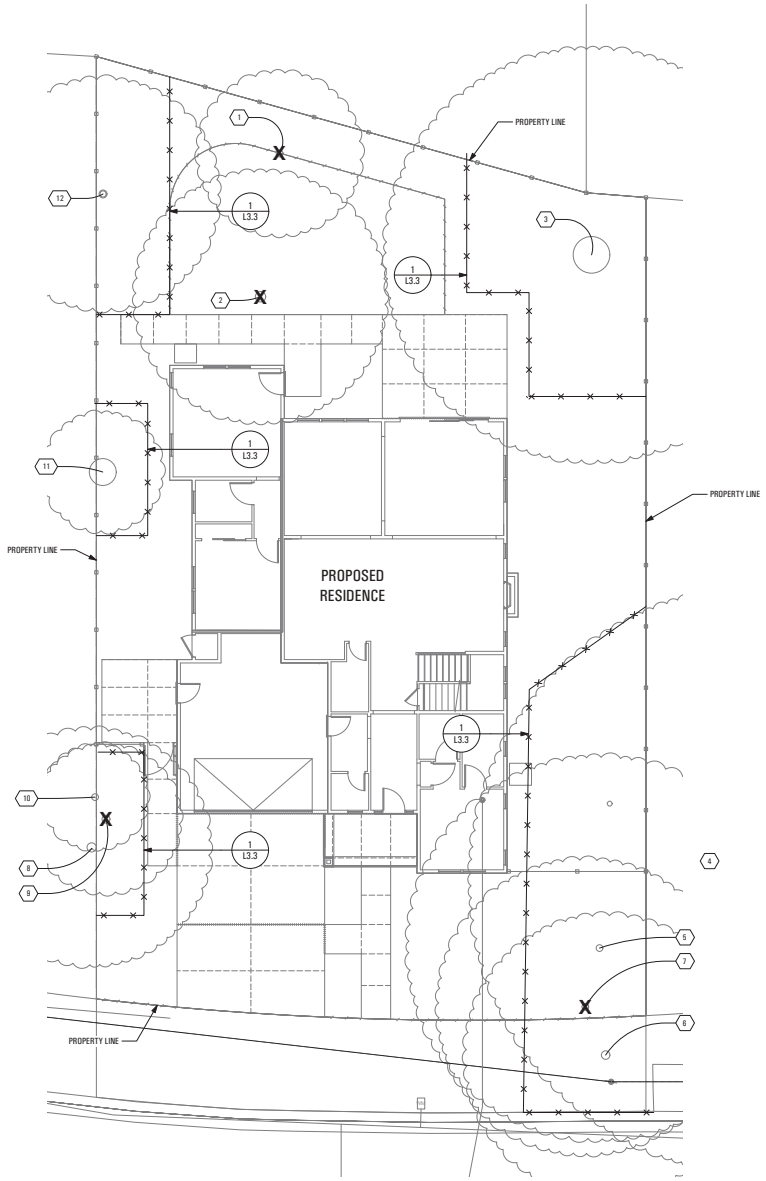
Sheet Title:
PLANTING DETAILS

Sheet No.:
L3.2



ARDEN ROAD

TREE PROTECTION LEGEND

(E) TREE TO REMAIN, TYP.

(E) TREE TO BE REMOVED, TYP.

TREE PROTECTION FENCING

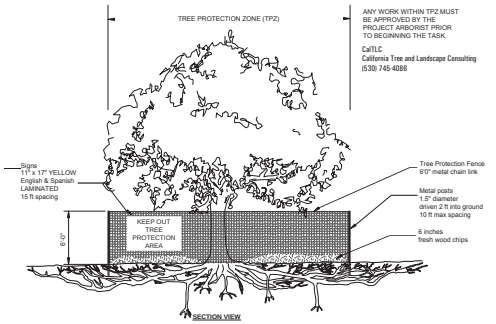
TREE PROTECTION NOTES

1. Consult the arborist report for tree protection guidelines. Refer to the arborist report "REVISED PROGRESS ARBORIST REPORT, TREE INVENTORY, CONSTRUCTION IMPACT ASSESSMENT & TREE PROTECTION PLAN, November 17, 2025" prepared by California Tree and Landscape Consulting, Inc.
2. Trees and shrubs not identified within the arborist report, but as included in survey drawings, are included for reference only.
3. Protect all existing items that are not noted for removal.
4. Existing trees to remain unless noted otherwise. Do not stockpile, drive over, or otherwise disturb soil under driplines of existing trees, except as required for planting operations.
5. Use hand tools only for work under driplines of existing trees to remain.
6. Trees noted to be removed shall be completely removed, including stump and root mass. Refer to arborist report for instructions on removing tree stumps within protected tree root zones.
7. No roots over 2" in diameter shall be cut except under the direction of an arborist. All cut roots shall be covered with burlap or straw and shall remain moist until re-buried in soil.
8. No mechanized tilling within 8x the trunk diameter of any tree.
9. New plantings within 8x the trunk diameter of any protected tree shall be performed by hand, disturbing the minimum surface area necessary to install the plants and without disturbing any roots larger than 1" in diameter.
10. Fencing shall remain in place until construction equipment, materials, and debris have been removed from the site.
11. No chemicals or contaminated water shall be poured within Tree Protection fencing.

ARBORIST TREE PROTECTION GENERAL GUIDELINES

1. The Project Arborist for this project is California Tree & Landscape Consulting. Contact the Project Arborist at (530) 745-4086. The project arborist may continue to provide expertise and make additional recommendations during the construction process if and when additional impacts occur or tree response is poor. Monitoring and construction oversight by the project arborist is recommended for all projects and required when a final letter of assessment is required by the jurisdiction.
2. The Project Arborist should inspect the exclusionary root protection fencing installed by the contractor prior to any grading and/or grubbing for compliance with the recommended protection zones. Additionally, the project arborist shall inspect the fencing at the onset of each phase of construction. The protection zone for trees is specified as the 'canopy radius' in Appendix 2 unless otherwise specified in the preservation requirements. The location of the tree protection fencing shall be depicted on the plans pursuant to the arborist recommendations. Note 'dripline' is not an acceptable location for installation of tree protection fencing.
3. The Project Arborist should directly supervise any clearance pruning, irrigation, fertilization, placement of mulch and/or chemical treatments. If clearance pruning is required, the Project Arborist should approve the extent of foliage elevation and oversee the pruning to be performed by a contractor who is an ISA Certified Arborist. Clearance pruning should include removal of all the lower foliage that may interfere with equipment PRIOR to having grading or other equipment on site.
4. Clearly designate an area on the site outside the drip line of all trees where construction materials may be stored, and parking can take place. No materials or parking shall take place within the root zones of protected trees.
5. Any and all work to be performed inside the protected root zone fencing, including all grading and utility trenching, shall be approved and/or supervised by the Project Arborist.
6. Trenching, if required, inside the protected root zone shall be approved and/or supervised by the Project Arborist and may be required to be by a hydraulic or air spade, placing pipes underneath the roots, or boring deeper trenches underneath the roots.

Keynote	Tag #	Heritage	Offsite	Common Name	Botanical Name	DBH (inches)	Status	Note
1	5606	N	N	Laurel	Laurus sp.	11	Remove	
2	5607	Y	N	Blackwood Acacia	Acacia melanoxylon	17	Remove	
3	5608	Y	N	Coast Redwood	Sequioa sempervirens	61	Retain and Protect	
4	5609	Y	Y	London Planetree	Platanus x hispanica	20	Retain and Protect	
5	5610	Y	N	Privet	Ligustrum sp.	16	Retain and Protect	
6	5611	N	N	English Walnut	Juglans regia	14	Retain and Protect	
7	5612	N	N	Japanese Cheesewood	Pittosporam tobira	11	Remove	
8	5613	Y	Y	California Bay Laurel	Umbellularia californica	15	Retain and Protect	
9	5614	N	N	California Bay Laurel	Umbellularia californica	13	Remove	
10	5615	N	N	California Bay Laurel	Umbellularia californica	11	Retain and Protect	
11	5616	Y	N	Coast Live Oak	Quercus agrifolia	44	Retain and Protect	
12	5654	N	N	Coast Live Oak	Quercus agrifolia	6.5	Retain and Protect	



1 TREE PROTECTION FENCING
SCALE: NTS

I HAVE COMPLIED WITH THE CRITERIA OF THE WATER CONSERVATION IN LANDSCAPE ORDINANCE AND HAVE APPLIED THEM FOR THE EFFICIENT USE OF WATER IN THE LANDSCAPE AND IRRIGATION DESIGN.

JORGE DANIEL ABICH, PLA (CA #5899)

SCALE: 1/8" = 1'-0"

0 4 8 12 16 20 FT

SKETCH & FIELD
Landscape Architecture | Exterior Design
1935 Addison Street, Suite A
Berkeley, CA 94704
(510) 905-7444

Project Title:

LANDSCAPE IMPROVEMENTS

365 ARDEN ROAD
MENLO PARK, CA 94025

Stamp:

Date No. Revision Notes

Issue Status: PERMIT SET	Project ID: 2507-03
Drawn By: DJ	Reviewed By: PJ
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title:

TREE PROTECTION PLAN

Sheet No.:

L3.3

Appendix 3 – General Practices for Tree Protection

Definitions:

Root zone: The roots of trees grow fairly close to the surface of the soil, and spread out in a radial direction from the trunk of tree. A general rule of thumb is that they spread 2 to 3 times the radius of the canopy, or 1 to 1½ times the height of the tree. It is generally accepted that disturbance to root zones should be kept as far as possible from the trunk of a tree.

Inner Bark: The bark on large valley oaks and coast live oaks is quite thick, usually 1" to 2". If the bark is knocked off a tree, the inner bark, or cambial region, is exposed or removed. The cambial zone is the area of tissue responsible for adding new layers to the tree each year, so by removing it, the tree can only grow new tissue from the edges of the wound. In addition, the wood of the tree is exposed to decay fungi, so the trunk present at the time of the injury becomes susceptible to decay. Tree protection measures require that no activities occur which can knock the bark off the trees.

Methods Used in Tree Protection:

No matter how detailed Tree Protection Measures are in the initial Arborist Report, they will not accomplish their stated purpose unless they are applied to individual trees and a Project Arborist is hired to oversee the construction. The Project Arborist should have the ability to enforce the Protection Measures. The Project Arborist should be hired as soon as possible to assist in design and to become familiar with the project. He must be able to read and understand the project drawings and interpret the specifications. He should also have the ability to cooperate with the contractor, incorporating the contractor's ideas on how to accomplish the protection measures, wherever possible. It is advisable for the Project Arborist to be present at the Pre-Bid tour of the site, to answer questions the contractors may have about Tree Protection Measures. This also lets the contractors know how important tree preservation is to the developer.

Root Protection Zone (RPZ): Since in most construction projects it is not possible to protect the entire root zone of a tree, a Root Protection Zone is established for each tree to be preserved. The minimum Root Protection Zone is the area underneath the tree's canopy (out to the dripline, or edge of the canopy), plus 1'. The Project Arborist must approve work within the RPZ.

Irrigate, Fertilize, Mulch: Supplemental irrigation, fertilization and or addition of mulch may be required at some point in time during the course of construction. The project arborist will recommend any or all of these mitigation measures as necessary during the course of construction.

Fence: Fence around the Root Protection Zone and restrict activity therein to prevent soil compaction by vehicles, foot traffic or material storage. The fenced area shall be off limits to all construction equipment, unless there is express written notification provided by the Project Arborist, and impacts are discussed and mitigated prior to work commencing.

A protective barrier of 6' chain link fence shall be installed around the dripline of protected tree(s). The fencing can be moved within the dripline if authorized by the project arborist or city arborist, but not closer than 2' from the trunk of any tree. Fence posts shall be 8' tall and 2" in diameter. Galvanized posts are to be driven 24" into the ground. The distance between posts shall not be more than 10'. Movable barriers of chain link fencing secured to cement blocks can be substituted for "fixed" fencing if the project arborist and city arborist agree that the fencing will have to be moved to accommodate

certain phases of construction. The builder may not move the fence without authorization from the project or city arborist.

Where the city or project arborist has determined that tree protection fencing will interfere with the safety of work crews, tree wrap may be used as an alternative form of tree protection. Wooden slats at least 1" thick are to be bound securely, edge to edge, around the trunk. A single layer or more of orange plastic construction fencing is to be wrapped and secured around the outside of the wooden slats. Major scaffold limbs may require protection as determined by the city or project arborist. Straw waddle may also be used as a trunk wrap by coiling waddle around the trunk up to a minimum height of 6' from grade. A single layer or more of orange plastic construction fencing is to be wrapped and secured around the straw waddle.

Signage should be placed on the protective tree fence no further than 30' apart. The signage should present the following information:

- "TREE PROTECTION FENCE – DO NOT MOVE OR REMOVE WITHOUT APPROVAL FROM CITY ARBORIST"
- Storage of building materials or soil is prohibited within the Tree Protection Zone.
- Construction or operation of construction equipment is prohibited within the tree protection zone.

In areas with many trees, the RPZ can be fenced as one unit, rather than separately for each tree.

Do not allow run off or spillage of damaging materials into the area below any tree canopy.

Do not store materials, stockpile soil or park or drive vehicles within the TPZ.

Do not cut, break, skin or bruise roots, branches, or trunks without first obtaining authorization from the city arborist.

Do not allow fires under and adjacent to trees.

Do not discharge exhaust into foliage.

Do not secure cable, chain or rope to trees or shrubs.

Do not trench, dig, or otherwise excavate within the dripline or TPZ of the tree(s) without first obtaining authorization from the city arborist.

Do not apply soil sterilant under pavement near existing trees.

Only excavation by hand, compressed air or hydro-vac shall be allowed within the dripline of trees.

Elevate Foliage: Where indicated, remove lower foliage from a tree to prevent limb breakage by equipment. Low foliage can usually be removed without harming the tree, unless more than 25% of the foliage is removed. Branches need to be removed at the anatomically correct location in order to prevent decay organisms from entering the trunk. For this reason, a contractor who is an ISA Certified Arborist should perform all pruning on protected trees.[5]

Expose and Cut Roots: Breaking roots with a backhoe, or crushing them with a grader, causes significant injury, which may subject the roots to decay. Ripping roots may cause them to splinter toward the base of the tree,

[5] International Society of Arboriculture (ISA), maintains a program of Certifying individuals. Each Certified Arborist has a number and must maintain continuing education credits to remain Certified.

creating much more injury than a clean cut would make. At any location where the root zone of a tree will be impacted by a trench or a cut (including a cut required for a fill and compaction), the roots shall be exposed with either a backhoe digging radially to the trunk, by hand digging, or by a hydraulic air spade, and then cut cleanly with a sharp instrument, such as chainsaw with a carbide chain. Once the roots are severed, the area behind the cut should be moistened and mulched. A root protection fence should also be erected to protect the remaining roots, if it is not already in place. Further grading or backhoe work required outside the established RPZ can then continue without further protection measures.

Protect Roots in Deeper Trenches: The location of utilities on the site can be very detrimental to trees. Design the project to use as few trenches as possible, and to keep them away from the major trees to be protected. Wherever possible, in areas where trenches will be very deep, consider boring under the roots of the trees, rather than digging the trench through the roots. This technique can be quite useful for utility trenches and pipelines.

Route pipes outside of the area that is 10 times the diameter of the protected tree to avoid conflicts with roots. Where it is not possible to reroute pipes or trenches, the contractor shall bore beneath the dripline of the tree. The boring shall take place not less than 3' below the surface of the soil in order to avoid encountering feeder roots. Alternatively, the trench can be excavated using hand, pneumatic of hydro-vac techniques within the RPZ. The goal is to avoid damaging the roots while excavating. The pipes should be fed under the exposed roots. Trenches should be filled within 24 hours, but where this is not possible the side of the trench adjacent to the trees shall be kept shaded with 4 layers of dampened, untreated burlap, wetted as frequently as necessary to keep the burlap wet.

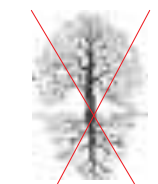
Protect Roots in Small Trenches: After all construction is complete on a site, it is not unusual for the landscape contractor to come in and sever a large number of "preserved" roots during the installation of irrigation systems. The Project Arborist must therefore approve the landscape and irrigation plans. The irrigation system needs to be designed so the main lines are located outside the root zone of major trees, and the secondary lines are either laid on the surface (drip systems), or carefully dug with a hydraulic or air spade, and the flexible pipe fed underneath the major roots.

Design the irrigation system so it can slowly apply water (no more than ¼" to ½" of water per hour) over a longer period of time. This allows deep soaking of root zones. The system also needs to accommodate infrequent irrigation settings of once or twice a month, rather than several times a week.

Monitoring Tree Health During and After Construction: The Project Arborist should visit the site at least once a month during construction to be certain the tree protection measures are being followed, to monitor the health of impacted trees, and make recommendations as to irrigation or other needs.

Root Structure

The majority of a tree's roots are contained in a radius from the main trunk outward approximately two to three times the canopy of the tree. These roots are located in the top 6" to 3' of soil. It is a common misconception that a tree underground resembles the canopy (see Drawing A below). The correct root structure of a tree is in Drawing B. All plants' roots need both water and air for survival. Surface roots are a common phenomenon with trees grown in compacted soil. Poor canopy development or canopy decline in mature trees is often the result of inadequate root space and/or soil compaction.



Drawing A
Common misconception of where tree roots are assumed to be located



Drawing B
The reality of where roots are generally located

Structural Issues

Limited space for canopy development produces poor structure in trees. The largest tree in a given area, which is 'shading' the other trees is considered Dominant. The 'shaded' trees are considered Suppressed. The following picture illustrates this point. Suppressed trees are more likely to become a potential hazard due to their poor structure.



Co-dominant leaders are another common structural problem in trees.

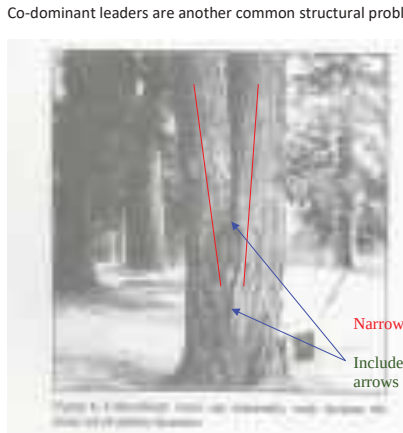


Photo from Evaluation of Hazard Trees in Urban Areas by Nelda P. Matheny and James R. Clark, 1994 International Society of Arboriculture

Pruning Mature Trees for Risk Reduction

There are few good reasons to prune mature trees. Removal of deadwood, directional pruning, removal of decayed or damaged wood, and end-weight reduction as a method of mitigation for structural faults are the only reasons a mature tree should be pruned. Live wood over 3" should not be pruned unless absolutely necessary. Pruning cuts should be clean and correctly placed. Pruning should be done in accordance with the American National Standards Institute (ANSI) A300 standards. It is far better to use more small cuts than a few large cuts as small pruning wounds reduce risk while large wounds increase risk.

Pruning causes an open wound in the tree. Trees do not "heal" they compartmentalize. Any wound made today will always remain, but a healthy tree, in the absence of decay in the wound, will 'cover it' with callus tissue. Large, old pruning wounds with advanced decay are a likely failure point. Mature trees with large wounds are a high failure risk.

Overweight limbs are a common structural fault in suppressed trees. There are two remedial actions for overweight limbs (1) prune the limb to reduce the extension of the canopy, or (2) cable the limb to reduce movement. Cables do not hold weight they only stabilize the limb and require annual inspection.

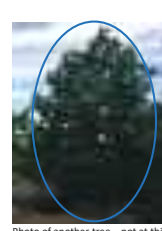


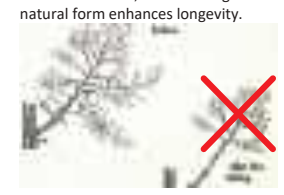
Photo of another tree – not at this site.



Photo of another tree – not at this site

Lion's – Tailing is the pruning practice of removal of "an excessive number of inner and/or lower lateral branches from parent branches. Lion's tailing is not an acceptable pruning practice" ANSI A300 (part 1) 4.23. It increases the risk of failure.

Pruning – Cutting back trees changes their natural structure, while leaving trees in their natural form enhances longevity.





Arborist Classifications

There are different types of Arborists:

Tree Removal and/or Pruning Companies. These companies may be licensed by the State of California to do business, but they do not necessarily know anything about trees;

Arborists. Arborist is a broad term. It is intended to mean someone with specialized knowledge of trees but is often used to imply knowledge that is not there.

ISA Certified Arborist: An International Society of Arboriculture Certified Arborist is someone who has been trained and tested to have specialized knowledge of trees. You can look up certified arborists at the International Society of Arboriculture website: isa-arbor.org.

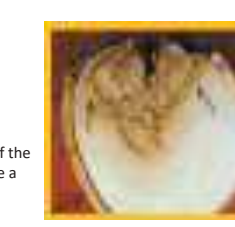
Consulting Arborist: An American Society of Consulting Arborists Registered Consulting Arborist is someone who has been trained and tested to have specialized knowledge of trees and trained and tested to provide high quality reports and documentation. You can look up registered consulting arborists at the American Society of Consulting Arborists website: https://www.asca-consultants.org/

Decay in Trees

Decay (in General): Fungi cause all decay of living trees. Decay is considered a disease because cell walls are altered, wood strength is affected, and living sapwood cells may be killed. Fungi decay wood by secreting enzymes. Different types of fungi cause different types of decay through the secretion of different chemical enzymes. Some decays, such as white rot, cause less wood strength loss than others because they first attack the lignin (causes cell walls to thicken and reduces susceptibility to decay and pest damage) secondarily the cellulose (another structural component in a cell walls). Others, such as soft rot, attack the cellulose chain and cause substantial losses in wood strength even in the initial stages of decay. Brown rot causes wood to become brittle and fractures easily with tension. Identification of internal decay in a tree is difficult because visible evidence may not be present.



According to Evaluation of Hazard Trees in Urban Areas (Matheny, 1994) decay is a critical factor in the stability of the tree. As decay progresses in the trunk, the stem becomes a hollow tube or cylinder rather than a solid rod. This change is not readily apparent to the casual observer. Trees require only a small amount of bark and wood to transport water, minerals and sugars. Interior heartwood can be eliminated (or degraded) to a great degree without compromising the transport process. Therefore, trees can contain significant amounts of decay without showing decline symptoms in the crown.



Compartmentalization of decay in trees is a biological process in which the cellular tissue around wounds is changed to inhibit fungal growth and provide a barrier against the spread of decay agents into additional cells. The weakest of the barrier zones is the formation of the vertical wall. Accordingly, while a tree may be able to limit decay progression inward at large pruning cuts, in the event that there are more than one pruning cut located vertically along the main trunk of the tree, the likelihood of decay progression and the associated structural loss of integrity of the internal wood is high.

Oak Tree Impacts

Our native oak trees are easily damaged or killed by having the soil within the Critical Root Zone (CRZ) disturbed or compacted. All of the work initially performed around protected trees that will be saved should be done by people rather than by wheeled or track type tractors. Oaks are fragile giants that can take little change in soil grade, compaction, or warm season watering. Don't be fooled into believing that warm season watering has no adverse effects on native oaks. Decline and eventual death can take as long as 5-20 years with poor care and inappropriate watering. Oaks can live hundreds of years if treated properly during construction, as well as later with proper pruning, and the appropriate landscape/irrigation design.

SKETCH & FIELD
Landscape Architecture | Exterior Design

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Project Title:

LANDSCAPE IMPROVEMENTS

365 ARDEN ROAD
MENLO PARK, CA 94025

Stamp:

LICENSED LANDSCAPE ARCHITECT
Jorge Daniel Abich 6068
Signature 12/31/2027 Renewal Date 1/27/2026 Date
STATE OF CALIFORNIA

Date	No.	Revision Notes

Issue Note: PERMIT SET	Project ID: 2507-03
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Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title:

TREE PROTECTION GUIDELINES

Sheet No.

L3.4

A23

HERITAGE TREE AND CITY TREE PROTECTION SPECIFICATIONS FOR CONSTRUCTION

Public Works
333 Burgess Dr., Menlo Park, CA 94025
tel 650-330-6760

Background

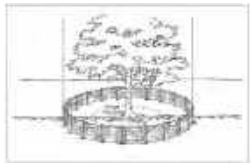
Tree protection measures are required for all heritage trees and city owned trees being retained on or immediately adjacent to active construction sites.

Violation of any of the below provisions may result in heritage tree violation fines, issuance of a stop work order, or other disciplinary action.

Instructions

1. Retain a city approved consulting arborist as the Project Arborist to design and monitor tree protection specifications. The Project Arborist shall report violations of the tree protection specifications by the Contractor to the City Arborist as an issue of non-compliance.
2. Design and implement tree protection measures before construction begins.
   - A tree protection fencing verification letter is required prior to building permit issuance.
3. Report damage of heritage tree(s) by construction activities to the Project Arborist or City Arborist within six (6) hours. Remedial action should be taken within 48 hours.
4. Delineate a Tree Protection Zone (TPZ) around the dripline of protected tree(s). The Project Arborist may establish, with approval by the City Arborist, a larger or smaller TPZ based on the species tolerance, health and vigor of the tree(s).
5. Construct a protective barrier around the TPZ (see Figure 1 below) with the following specifications:
   - Fencing shall be six (6)-foot-tall chain link;
   - Fence posts shall be 1.5 inches in diameter, driven 2 feet into the ground, at most 10 feet apart;
   - Signage (in both English and Spanish) should be printed on an 11" x 17" yellow-colored paper and secured in a prominent location on each protection fence. Signage shall include the Project Arborist's contact information;
   - Fencing may be moved to within the TPZ if authorized by the Project Arborist and City Arborist. The fence must remain at least 1.5 times the diameter of the tree from its trunk (i.e. The fence must remain at least 30-inches from the trunk of a 20-inch tree); and
   - Movable barriers of chain link fencing secured to cement blocks may be substituted for fixed fencing if the Project Arborist and City Arborist agree that the fencing will have to be moved to accommodate certain phases of construction. The builder may not move the fence without authorization from the Project Arborist or City Arborist.

Figure 1: Fenced tree protection zone



Matheny, N., Smiley, E. T., Gilpin, R., & Hauer, R. (2023). Managing trees during construction (3rd ed.). International Society of Arboriculture.

6. Place a 6-inch layer of coarse mulch or woodchips covered with ¾-inch plywood or alternative within the TPZ prior to construction activity. Placement of this protective covering will reduce soil compaction and root impacts. It will also help the soil retain moisture for the roots.
7. As specified by the Project Arborist, ensure adequate irrigation is supplied to the trees on a regular basis. Irrigation helps the trees tolerate root impacts better. Hand watering or drip irrigation lines would suffice. In most cases, irrigation is needed once every 2-3 weeks depending on soil moisture levels.
8. Prohibit the following activities within the TPZ. DO NOT:
   - Place heavy machinery for excavation;
   - Allow runoff or spillage of damaging materials;
   - Store or stockpile materials, tools, or soil;
   - Park or drive vehicles;
   - Trench, dig, or otherwise excavate without first obtaining authorization from the City Arborist or Project Arborist;
   - Change soil grade; and
   - Trench with a machine.
9. When work must occur within the TPZ of a heritage tree (as authorized by the Project Arborist or City Arborist) install trunk protections (see Figure 2 below) with the following specifications:
   - Securely bind wooden slats at least 1-inch-thick around the trunk (preferably on a closed-cell foam pad). Secure and wrap at least one layer of orange plastic construction fencing around the outside of the wooden slats for visibility;
   - DO NOT drive fasteners into the tree;
   - Install trunk protection immediately prior to work within the TPZ and remove protection from the tree(s) as soon as work moves outside the TPZ;
   - Protect major scaffold limbs as determined by the City Arborist or Project Arborist; and
   - If necessary, install wooden barriers at an angle so that the trunk flare and buttress roots are also protected.

Figure 2: Trunk Protection



Matheny, N., Smiley, E. T., Gilpin, R., & Hauer, R. (2023). Managing trees during construction (3rd ed.). International Society of Arboriculture.

10. To avoid injury to tree roots:
    - Only excavate carefully by hand, compressed air, or high-pressure water within the dripline of trees;
    - When the Contractor encounters roots smaller than 2-inches, hand-trim the wall of the trench adjacent to the trees to make even, clean cuts through the roots;
    - Cleanly cut all damaged and torn roots to reduce the incidence of decay;
    - Fill trenches within 24 hours. When it is infeasible to fill trenches within 24 hours, shade the side of the trench adjacent to the trees with four layers of dampened, untreated burlap. Wet burlap as frequently as necessary to maintain moisture; and

    - When the Contractor encounters roots 2 inches or larger, report immediately to the Project Arborist. The Project Arborist will decide whether the Contractor may cut roots 2 inches or larger. If a root is retained, excavate by hand or with compressed air under the root. Protect preserved roots with dampened burlap.
11. Route pipes outside of the area that is 10 times the diameter of a protected tree to avoid conflict with roots.
12. Where it is not possible to reroute pipes or trenches, bore beneath the dripline of the tree. Do not bore less than 3-inches below the surface of the soil to avoid damage to small feeder roots.
13. Avoid the following conditions. DO NOT:
    - Cut, break, skin, or bruise roots, branches, or trunks without authorization from the City Arborist;
    - Allow fires under and adjacent to trees;
    - Discharge exhaust into foliage;
    - Direct runoff toward trees;
    - Secure cable, chain, or rope to trees; and
    - Apply soil sterilants under pavement near existing trees.

Periodic inspections

The Project Arborist must provide periodic, on-site tree protection inspections during construction which:

- Occur at least once every four (4) weeks;
- Monitor the effectiveness of the Tree Protection Plan;
- Provide recommendations for any necessary additional care or treatment; and
- Will be followed by monthly construction monitoring reports emailed directly to the City Arborist.

SKETCH & FIELD
Landscape Architecture | Exterior Design
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Project Title:

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365 ARDEN ROAD
MENLO PARK, CA 94025

Stamp:

LICENSED LANDSCAPE ARCHITECT
Thomas Jacob Hobson
Registration
12/31/2027
Renewal Date
1/27/2026
Date
STATE OF CALIFORNIA

Date	No.	Revision Notes

Issue Status: PERMIT SET	Project ID: 2507-03
Drawn By: D1	Reviewed By: P1
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title:

TREE PROTECTION GUIDELINES

Sheet No.:

L3.5

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 07/30/2025
Date Submitted 07/24/2025

To: Angel Wilson
Mid Pacific Engineering-Lodi
P.O. Box 876
Victor, CA 95253

From: Gene Oliphant, Ph.D. \ Ty Rui
General Manager \ Lab Manager

The reported analysis was requested for the following:
Location : 06876-01 Site ID : HA1-1 (12-18").
Your purchase order number is 664318. Thank you for your business.

* For future reference to this analysis please use SUN # 95180-196846

SOIL ANALYSIS

Saturation Percent (SP)	53		Soil Texture Clay Loam
pH	6.36		
E.C.	0.44	mmho/cm	
Tot.Dissolved Salts	281.6	ppm	
Infiltration Rate (0% Slope)	0.25	in/hr	
% Organic Matter	4.5		
C.E.C.	23.3	meq/100g	
Sodium Absorption Ratio (SAR)	2.7		
Exchangable Sodium Percent (ESP)	2.6		
Gypsum Req. (CaSO4*2H2O)	None Required		
est. Nitrogen Release	1.5	#/1000 sq.ft.	

Nitrate	0.05	ppm	*
Phosphorus	91.68	ppm	************************
Potassium	262.82	ppm	************************
Sulfur	10.62	ppm	**********
Chloride	No Test		
Carbonates	No Test		
Sodium	138.77	ppm	
Calcium	3591.44	ppm	************************
Magnesium	495.93	ppm	**************
Boron	0.21	ppm	******
Copper	No Test		
Iron	No Test		
Manganese	No Test		
Zinc	No Test		

Very Low | Low | Adequate | Excessive

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

DATE 07/30/2025
SUN NUMBER 196846

Information requested by:
Angel Wilson
Mid Pacific Engineering-Lodi

Information for:
06876-01
Sample ID: HA1-1 (12-18")

SOIL RECOMMENDATIONS FOR LANDSCAPE GARDENING

SOIL pH (Acidity and Alkalinity)
The pH of this sample indicates the soil is moderately acid and should be modified for non acid-tolerant plants. Apply 20 pounds of Lime per 1000 sq.ft. and work into ground before planting.

DISSOLVED SALTS (Indicated by E.C. & TDS)
These conditions are in the normal range for plant growth.

SOIL TEXTURE AND RATE OF WATER INFILTRATION
The infiltration rate for all soil textures decreases with increasing ground slope. At 0 to 4%, 5 to 8%, 9 to 12%, 13 to 16% and above 16% the infiltration rate of this sample decreases from 0.25 to 0.20, 0.15, 0.10, 0.06, respectively. Infiltration rate also decreases with percent of ground cover and by compaction.

WATER PENETRATION OF SOIL DUE TO CHEMICAL CHARACTERISTICS
When exchangable Sodium increases in the soil, water penetration decreases. Based on SAR and ESP values this sample has no penetration problem due to soil Sodium. No Gypsum required.

ORGANIC MATTER
Organic matter provides a slow nitrogen release and aids water retention. This sample has a moderate Organic Matter content.
To maintain moisture and provide sustained nitrogen release a level of 10% organic matter is recommended. This can be accomplished by adding 3 yards per 1000 sq.ft. of ground fir bark that is approximately 75% organic matter (i.e. typically found in ground fir bark which also has naturally low salt and boron concentrations). In California, the MWELO ordenance requires a fixed application of four yards of COMPOST if the soil organic matter is less than 6%. However, of significant concern when applying COMPOST is the potential for the compost to have high salt, high boron content, high C to N ratio and having a higly variable pH (very high to very low). All of these COMPOST characteristics can have very negative affect on plant growth. Take care by having the compost analysed or by seeing a recent analysis of the compost to be used.

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

PAGE #2

DATE 07/30/2025
SUN NUMBER 196846

Information requested by:
Angel Wilson
Mid Pacific Engineering-Lodi

Information for:
06876-01
Sample ID: HA1-1 (12-18")

SOIL RECOMMENDATIONS FOR LANDSCAPE GARDENING

SOIL BORON
Boron concenrations are in a range allowing normal plant growth.
SOIL MACRONUTRIENTS : NITROGEN-PHOSPHORUS-POTASSIUM (N-P-K)
GENERAL N-P-K RECOMMENDATION

Use ONE of these NPK preparations for the first fertilizer application.

Standard NPK Fertilizer Preparations	6-24-24	5-20-10	16-16-16	0-10-10	28-3-4	21-0-0	Customer Choice None
#/1000 sq.ft.	N/A	N/A	N/A	N/A	4	6	**

GRASS OR SOD PREPARATION
Till in organic matter, N,P,K and micro nutrients in addition to any lime gypsum or sulfur as directed above. Smooth soil surface and follow seed or sod producers direction for moisture and product application.

TREES AND SHRUBS
Excavate holes for planting shrubs and trees to at least twice the volume of the container. Prepare backfill for tree and shrub planting holes by mixing three parts of native soil (or imported top soil) with one part organic amendment (preferably nitrogen and iron fortified) and 2.5 pounds of 6-24-24 per yard of mix. For extended fertilization, place slow release fertilizer tablets in each hole per manufacturer's instructions. If 6-24-24 was not directly added to backfill mix, during backfill apply uniformly 1/2 oz of 6-24-24 per gallon containers, 2.5 oz per 5 gallons, 6 oz per 24 inch boxes.

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

PAGE #3

DATE 07/30/2025
SUN NUMBER 196846

Information requested by:
Angel Wilson
Mid Pacific Engineering-Lodi

Information for:
06876-01
Sample ID: HA1-1 (12-18")

SOIL RECOMMENDATIONS FOR LANDSCAPE GARDENING

Summary and Suggested Sequence of Soil Improvements (#/1000 Sq.Ft.)

A2	Lime	20	#
	Organic Amendment	3	Yd./1000 Sq.Ft. Bulk organic amendment (nitrified). or in Calif. if Org.Mat. less than 6% use 4 yd compost.
	N-P-K Fertilizer	See above chart	
	Sulfate-Sulfur	2	# Ammonium Sulfate

Maintenance Fertilization
Apply 5 pounds of Ammonium sulfate (21-0-0) per 1000 sq.ft. every month until plants become established. After established, apply 28-3-4 (or similar preparation) to provide desired growth rate and color.

SKETCH & FIELD
Landscape Architecture | Exterior Design
1935 Addison Street, Suite A
Berkeley, CA 94704
(510) 905-7444

Project Title
LANDSCAPE IMPROVEMENTS
365 ARDEN ROAD
MENLO PARK, CA 94025

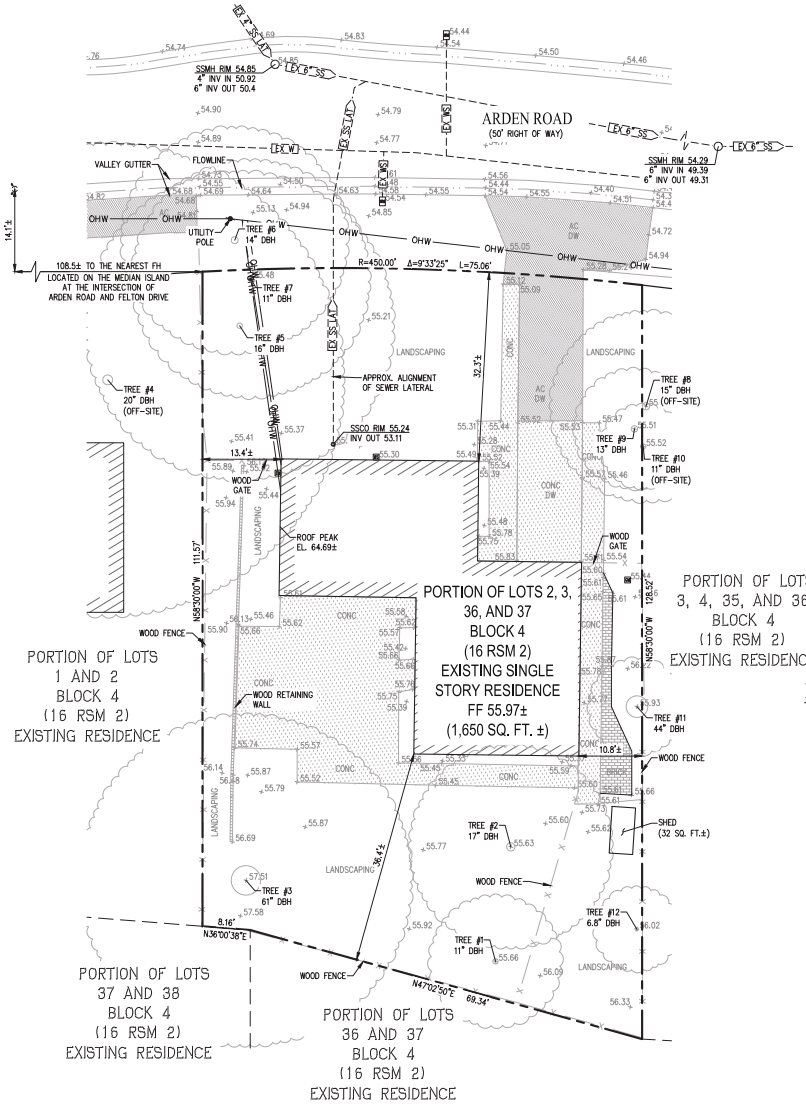
Stamp
LICENSED LANDSCAPE ARCHITECT
Registration 12/31/2027
Renewal Date 1/27/2026
STATE OF CALIFORNIA

Date	No.	Revision Notes

Issue Status: PERMIT SET	Project ID: 2507-03
Drawn By: D1	Reviewed By: P1
Date: 1/27/2026	CAD File Name: 365 Arden.vwx

Sheet Title
SOIL MANAGEMENT REPORT

Sheet No.
L3.6



LEGEND & ABBREVIATIONS

	BOUNDARY LINE
	CENTERLINE
	ADJACENT PROPERTY LINE
	EXISTING STRUCTURE
EX U/G	EXISTING UTILITY PIPE
OHW	EXISTING OVERHEAD WIRE
	FENCE LINE
	EXISTING ELECTRIC METER
	EXISTING GAS METER
103.30	EXISTING GROUND ELEVATION
	EXISTING FIRE HYDRANT
	EXISTING SANITARY SEWER CLEANOUT
	EXISTING SANITARY SEWER MANHOLE
	EXISTING WATER METER
AC	ASPHALT CONCRETE
CONC	CONCRETE
DBH	DIAMETER BREAST HEIGHT
DW	DRIVEWAY
EL	ELEVATION
EX	EXISTING
FF	FINISHED FLOOR
INV	INVERT
LAT	LATERAL
SS	SANITARY SEWER
SSCO	SANITARY SEWER CLEANOUT
SSMH	SANITARY SEWER MANHOLE
TYP	TYPICAL
W	WATER
WM	WATER METER
WS	WATER SERVICE

TITLE REPORT

FIDELITY NATIONAL TITLE COMPANY
TITLE NO.: FSMO-6552500527
DATED: JUNE 6, 2025

LEGAL DESCRIPTION:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF MENLO PARK, COUNTY OF SAN MATEO, STATE OF CALIFORNIA AND IS DESCRIBED AS FOLLOWS:

PORTION OF LOTS 2-3-36 AND 37 IN BLOCK 4, AS DESIGNATED ON THE MAP ENTITLED "FELTON GABLES MENLO PARK CALIF.", WHICH MAP WAS FILED IN THE OFFICE OF THE RECORDER OF THE COUNTY OF SAN MATEO, STATE OF CALIFORNIA ON MAY 7, 1927 IN BOOK 16 OF MAP AT PAGES 1 AND 2, MORE PARTICULARLY DESCRIBED AS:

BEGINNING AT A POINT ON THE LINE DIVIDING LOTS 1 AND 2 FROM LOTS 37 AND 38 IN SAID BLOCK, DISTANT THEREON NORTH 36° 00' 30" EAST 85.58 FEET FROM ITS INTERSECTION WITH THE NORTHEASTERLY LINE OF LAUREL DRIVE; THENCE CONTINUING ALONG SAID DIVIDING LINE NORTH 36° 00' EAST 6.16 FEET TO THE MOST WESTERLY CORNER OF LANDS DESCRIBED IN DEAD FROM JEROME C. DRAPER AND WIFE TO DAN D. ROBERTSON AND WIFE, DATED AND RECORDED JUNE 23, 1939 IN BOOK 845 OF OFFICIAL RECORDS OF SAN MATEO COUNTY AT PAGE 328; THENCE NORTH 47° 02' 50" EAST, ALONG THE NORTHWESTERLY LINE OF LANDS SO DESCRIBED, 69.34 FEET TO AN ANGLE POINT IN SAID NORTHWESTERLY LINE; THENCE LEAVING SAID NORTHWESTERLY LINE, NORTH 58° 30' WEST 130 FEET, MORE OR LESS, TO A POINT IN THE SOUTHEASTERLY LINE OF ARDEN AVENUE; THENCE SOUTHWESTERLY ALONG SAID SOUTHWESTERLY LINE OF ARDEN AVENUE, 75 FEET, MORE OR LESS, TO A POINT WHICH BEARS NORTH 58° 30' WEST FROM THE POINT OF BEGINNING AND THENCE SOUTH 58 30' EAST 108 FEET, MORE OR LESS, TO THE POINT OF BEGINNING.

EXCEPTIONS AND EXCLUSIONS:

(#) INDICATES TITLE REPORT ITEM NUMBER

ITEMS (1) THROUGH (5) RELATE TO TAXES AND LIENS, AND CANNOT BE PLOTTED.

ITEM (6) RELATES TO CC&R'S, AND CANNOT BE PLOTTED.

ITEM (7) RELATES TO ANY INVALIDITY OR DEFECT IN THE TITLE OF THE VESTEES, AND CANNOT BE PLOTTED.

ITEM (8) RELATES TO A CLTA OWNER'S POLICY, AND CANNOT BE PLOTTED.

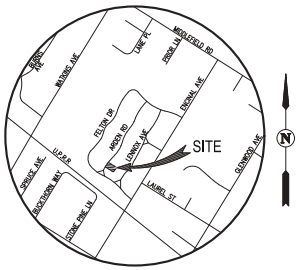
ITEM (9) RELATES TO ANY OPEN MORTGAGES OR DEED OF TRUST, AND CANNOT BE PLOTTED.

BENCHMARK:

BENCHMARK ID: MENLO PARK CITY BENCHMARK 7
DESCRIPTION: BRASS DISC SET IN TOP OF CURB, STAMPED "CITY BENCHMARK 7" LOCATED AT THE SOUTHERLY END OF THE SOUTHEASTERLY CURB RETURN AT THE INTERSECTION OF HARVARD AVENUE AND ALTO LANE
ELEVATION: 65.71' (NAVD 88)

BASIS OF BEARINGS:

THE BASIS OF BEARING FOR THIS SURVEY ARE PER THE LEGAL DESCRIPTION PROVIDED IN THE TITLE REPORT.



VICINITY MAP

NOT TO SCALE

NOTES:

1) RECORD INFORMATION AND PROPERTY DESCRIPTION ARE PER TITLE REPORT AND RECORDED MAPS IN SAN MATEO COUNTY LISTED HEREON.
2) UTILITIES SHOWN ARE BASED ON OBSERVED EVIDENCE AT THE TIME OF THE FIELD SURVEY. ADDITIONAL RESEARCH AND INVESTIGATION WOULD BE REQUIRED TO DETERMINE THE EXACT LOCATIONS OF UNDERGROUND UTILITIES. DO NOT RELY ON THIS SURVEY FOR SUCH LOCATIONS. SOME UTILITIES COULD BE COVERED BY STRUCTURES OR OBJECTS SUCH AS AUTOMOBILES, TRUCKS, CONTAINERS, ETC.
3) ALL DISTANCES SHOWN ARE FEET AND DECIMALS THEREOF.
4) ALL TIES SHOWN HEREON ARE PERPENDICULAR UNLESS OTHERWISE NOTED.
5) STRUCTURES, IMPROVEMENTS, AND TREES ON ADJACENT PROPERTIES HAVE NOT BEEN SURVEYED. LOCATIONS DEPICTED HEREIN ARE APPROXIMATE.
6) THE SQUARE FOOTAGE NOTED FOR STRUCTURES ARE APPROXIMATE AND REPRESENTATIVE OF THE SURVEYED EXTERIOR FOOTPRINT.
7) SURVEY UPDATED ON 11/18/2025 TO REFERENCE TREE INFORMATION PER PROJECT ARBORIST REPORT DATED 11/17/2025, PREPARED BY CALIFORNIA TREE AND LANDSCAPE CONSULTING, INC.
8) RIGHT OF WAY OF ARDEN ROAD AND LENNOX AVENUE ESTABLISHED BY SURVEYED LOCATION AND SPLIT OF EXISTING CURB LINES.

FLOOD ZONE:

ZONE X: AREA OF MINIMAL FLOOD HAZARD

SOURCE: FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA), FLOOD INSURANCE RATE MAP, MAP NUMBER 06081C0304E

DATED: OCTOBER 16, 2012

ASSESSOR'S PARCEL NUMBER:

061-323-020

AREA:

LOT AREA: 9,019 SQ. FT. MORE OR LESS

REFERENCES:

(#) INDICATES REFERENCE NUMBER
(1) 16 RSM 2

SURVEYOR'S STATEMENT:

THIS TOPOGRAPHIC SURVEY REPRESENTS A SURVEY BY ME OR UNDER MY DIRECTION.

MARK H. WEHBER
REGISTERED L.S. NO. 7960

07/30/2025
DATE

LICENSED LAND SURVEYOR
MARK H. WEHBER
7960
STATE OF CALIFORNIA

365 ARDEN ROAD
TOPOGRAPHIC SURVEY

CITY OF MENLO PARK COUNTY OF SAN MATEO CALIFORNIA

SCALE: 1" = 10' DATE: JULY 30, 2025

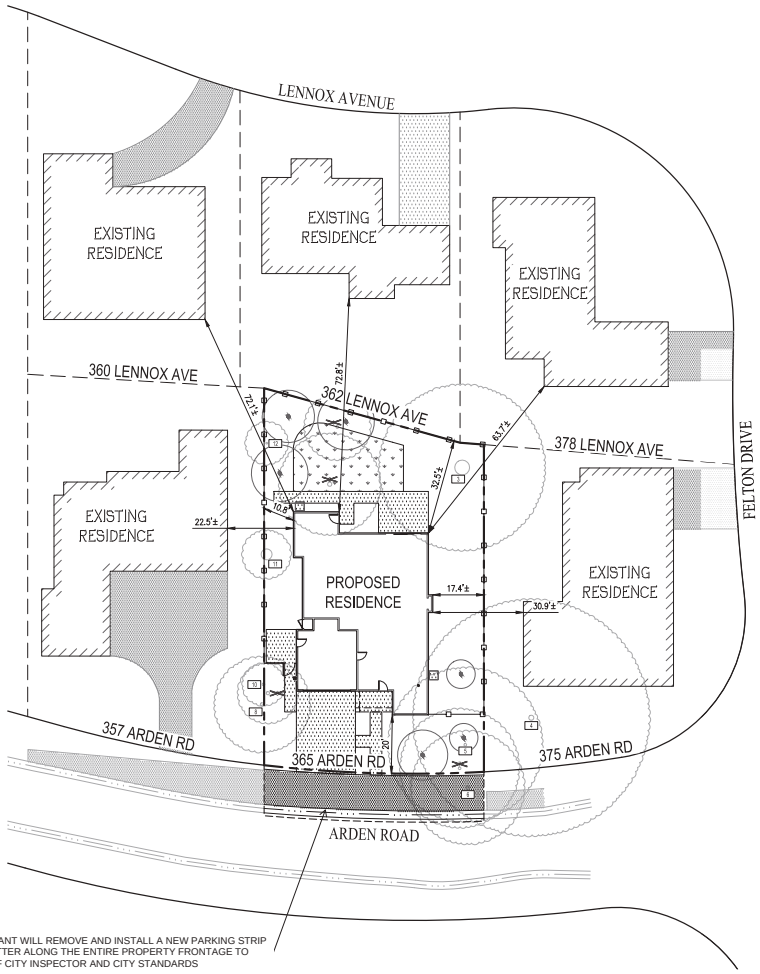
0 10 20 30

cbg CIVIL ENGINEERS ▪ SURVEYORS ▪ PLANNERS

SAN RAMON ▪ (925) 866-0322
ROSEVILLE ▪ (916) 788-4456
WWW.CBANDG.COM

SHEET NO. 1 OF 1 SHEETS

F:\3065-000\MENLO PARK\365 ARDEN ROAD\ACAD\EXHIBITS\365-LOT SURVEY_365 ARDEN RD.DWG



THE PROJECT/APPLICANT WILL REMOVE AND INSTALL A NEW PARKING STRIP AND NEW VALLEY GUTTER ALONG THE ENTIRE PROPERTY FRONTAGE TO THE SATISFACTION OF CITY INSPECTOR AND CITY STANDARDS

EXISTING TREES TO BE REMOVED

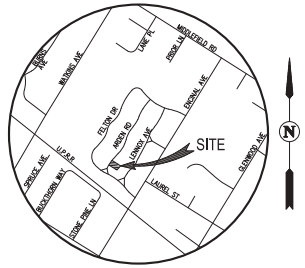
TREE NUMBER	TAG NUMBER	COMMON NAME	DBH (IN)	HERITAGE TREE	OFF-SITE
1	5606	LAUREL	11	NO	NO
2	5607	BLACKWOOD ACACIA	17	YES	NO
7	5612	JAPANESE CHEESEWOOD	11	NO	NO
9	5614	CALIFORNIA BAY LAUREL	13	NO	NO

EXISTING TREES TO REMAIN

TREE NUMBER	TAG NUMBER	COMMON NAME	DBH (IN)	HERITAGE TREE	OFF-SITE
3	5608	COAST REDWOOD	61	YES	NO
4	5609	LONDON PLANE TREE	20	YES	YES
5	5610	PRIVET	16	YES	NO
6	5611	ENGLISH WALNUT	14	NO	NO
8	5613	CALIFORNIA BAY LAUREL	15	YES	YES
10	5615	CALIFORNIA BAY LAUREL	11	NO	NO
11	5616	COAST LIVE OAK	44	YES	NO
12	5654	COAST LIVE OAK	6.8	NO	NO
NP	NP	N/A	N/A	N/A	N/A

NOTES:

1. THE TABLES ABOVE CONTAIN A SUMMARY OF INFORMATION PRESENTED IN THE ARBORIST REPORT. PLEASE REFER TO THE ARBORIST REPORT DATED JULY 22, 2025 AND PREPARED BY CALIFORNIA TREE AND LANDSCAPE CONSULTING, INC FOR MORE INFORMATION.



VICINITY MAP
NOT TO SCALE

LEGEND

- BOUNDARY LINE
- EXISTING RIGHT OF WAY
- ADJOINER PROPERTY LINE
- EXISTING STRUCTURE ON ADJOINING LOT
- EXISTING ASPHALT CONCRETE
- EXISTING CONCRETE
- PROPOSED NEW RESIDENCE
- PROPOSED SAWCUT
- PROPOSED VALLEY GUTTER
- PROPOSED ASPHALT CONCRETE
- PROPOSED CONCRETE FLATWORK
- PROPOSED TURF GRASS
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- EXISTING TREE
- PROPOSED TREE



ARDEN ROAD STREET SCAPE
SCALE: 1/8"=1'

365 ARDEN ROAD AVENUE
AREA PLAN
THOMAS JAMES HOMES

CITY OF MENLO PARK SAN MATEO COUNTY CALIFORNIA
SCALE: 1" = 20' DATE: NOVEMBER 20, 2025

0 20 40 60

cbg CIVIL ENGINEERS ▪ SURVEYORS ▪ PLANNERS

SAN RAMON ▪ (925) 866-0322
ROSEVILLE ▪ (916) 375-1877
WWW.CBANDG.COM

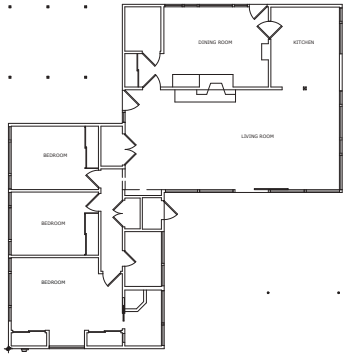
SHEET NO. AP-1 OF 1 SHEETS

F:\3385-000\MENLO PARK\365 ARDEN RD\ACAD\EXHIBITS\XS-AREA PLAN_365 ARDEN RD.DWG

SINGLE-FAMILY RESIDENCE

365 ARDEN ROAD
MENLO PARK, CA 94025

AS-BUILT DOCUMENTATION



PROJECT LINKS

CLICK HERE TO VIEW YOUR PLANS USING PPM'S WEB VIEWER POWERED BY AUTODESK

VICINITY MAP



AERIAL VIEW



PPM PROJECT CONTACTS

SOUTHWEST OFFICE

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(562) 621-9100

LINDSEY GREENE
PROJECT MANAGER
LGREENE@PPMCO.NET
(510) 479-7109 EXT. 222

CORPORATE OFFICE

OFFICE@PPMCO.NET
(855) 272-8458 EXT. 100
HTTPS://ASBUILTDRAWINGS.COM/

SHEET INDEX

SHEET	NAME
1	COVER PAGE
2	1ST FLOOR PLAN
3	ROOF PLAN
4	EXTERIOR ELEVATIONS

PREPARED FOR: ALICIA WILSON

PROJECT NAME: 365 ARDEN ROAD PROJECT
MENLO PARK, CA

PLAN TYPE: COVER PAGE

ALL SITE PLANS CREATED BY PRECISION PROPERTY MEASUREMENT LTD "PPM" ARE MADE EXCLUSIVELY FOR LANDSCAPING PURPOSES (CAL. BUS. & PROF. CODE §8727), & DO NOT INVOLVE THE DETERMINATION OF ANY PROPERTY LINE, & AS SUCH DO NOT CONSTITUTE LAND SURVEYING (CAL. BUS. & PROF. CODE §§8726-8727). IN ADDITION, PPM SERVICES & PLANS DO NOT CONSTITUTE CIVIL ENGINEERING (CAL. BUS. & PROF. CODE §§6702-6704), & THUS SHOULD NOT BE USED FOR ANY STUDIES OR ACTIVITIES DEFINED AS CIVIL ENGINEERING (CAL. BUS. & PROF. CODE §6731). ALL FLOOR PLANS CREATED BY PPM ARE INTENDED TO BE USED AS A REFERENCE FOR DESIGN & CONSTRUCTION & SHOULD NOT BE CONSIDERED A SUBSTITUTE FOR THE SERVICES OF A LICENSED STRUCTURAL ENGINEER OR LICENSED ARCHITECT. PPM MAKES EVERY REASONABLE EFFORT TO ENSURE THE ACCURACY OF THE INFORMATION FOUND IN OUR PLANS. HOWEVER, EVERY AS-BUILT DRAWING INHERENTLY CONTAINS ERRORS TO SOME DEGREE. IT IS THE DUTY OF THE ARCHITECT, CONTRACTOR, DESIGNER OR OTHER LICENSED PROFESSIONAL, AS A CONSULTANT TO THE PROPERTY OWNER, TO DETERMINE THE SUITABILITY OF THE AS-BUILT PLANS PRIOR TO CONSTRUCTION. MEASUREMENTS SHOULD BE FIELD CONFIRMED BEFORE COMMENCING CONSTRUCTION.

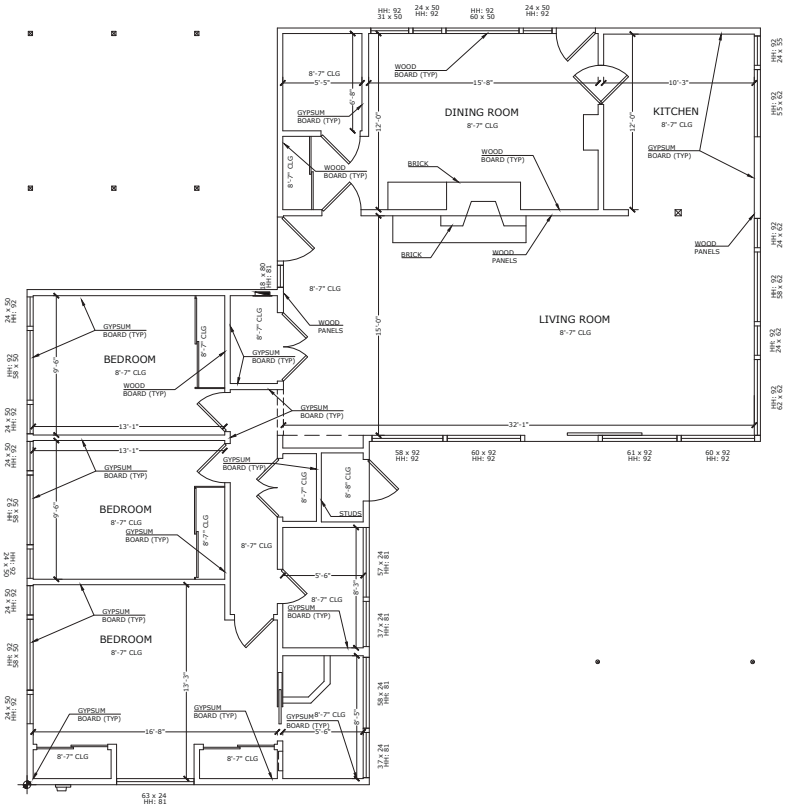
PROJECT NUMBER: 7180_BA
DATE: 08/19/2025

SCALE: N.T.S.

SHEET: 1 OF 4

LEGEND

LOW CASEWORK
UPPER CASEWORK
FULL HEIGHT CASEWORK
W/D = WASHER/DRYER COMBO
W = WASHER
D = DRYER
R = RANGE
REF = REFRIGERATOR
O = OVEN
DW = DISH WASHER
TC = TRASH COMPACTOR
FUR = FURNACE
TWH = TANKLESS WATER HEATER
WH = WATER HEATER
WS = WATER SOFTNER
FD = FLOOR DRAIN
GM = GAS METER
EM = ELECTRIC METER
PV = SOLAR COMPONENTS
= ELECTRICAL PANEL
= WALL HEATER
= DATUM POINT
CLG = CEILING HEIGHT
HH = HEADER HEIGHT



1ST FLOOR

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LEGEND

CHIMNEY OUTLINE

BUILDING FOOTPRINT

AIR CONDITIONER

ROOF TOP HATCH

ROOF DRAIN

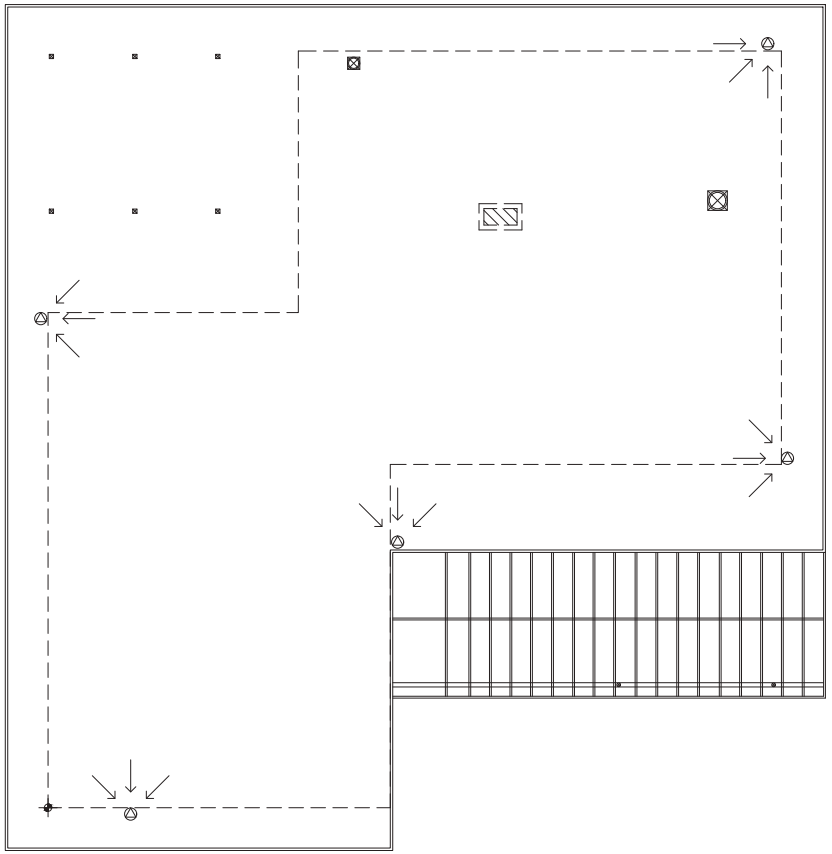
UTILITY BOX

DOWNSPOUT

ROOF VENT

RTU ROOF TOP UNIT

DATUM POINT



PRECISION PROPERTY MEASUREMENTS

PREPARED FOR

ALICIA WILSON

PROJECT NAME

365 ARDEN ROAD PROJECT

MENLO PARK, CA

PLAN TYPE

ROOF PLAN

ALL SITE PLANS CREATED BY PRECISION PROPERTY MEASUREMENT LTD "PPM" ARE MADE EXCLUSIVELY FOR LANDSCAPING PURPOSES (CAL. BUS. & PROF. CODE §8727), & DO NOT INVOLVE THE DETERMINATION OF ANY PROPERTY LINE, & AS SUCH DO NOT CONSTITUTE LAND SURVEYING (CAL. BUS. & PROF. CODE §§8726-8727). IN ADDITION, PPM SERVICES & PLANS DO NOT CONSTITUTE CIVIL ENGINEERING (CAL. BUS. & PROF. CODE §§6702-6704), & THUS SHOULD NOT BE USED FOR ANY STUDIES OR ACTIVITIES DEFINED AS CIVIL ENGINEERING (CAL. BUS. & PROF. CODE §6731). ALL FLOOR PLANS CREATED BY PPM ARE INTENDED TO BE USED AS A REFERENCE FOR DESIGN & CONSTRUCTION & SHOULD NOT BE CONSIDERED A SUBSTITUTE FOR THE SERVICES OF A LICENSED STRUCTURAL ENGINEER OR LICENSED ARCHITECT. PPM MAKES EVERY REASONABLE EFFORT TO ENSURE THE ACCURACY OF THE INFORMATION FOUND IN OUR PLANS. HOWEVER, EVERY AS-BUILT DRAWING INHERENTLY CONTAINS ERRORS TO SOME DEGREE. IT IS THE DUTY OF THE ARCHITECT, CONTRACTOR, DESIGNER OR OTHER LICENSED PROFESSIONAL, AS A CONSULTANT TO THE PROPERTY OWNER, TO DETERMINE THE SUITABILITY OF THE AS-BUILT PLANS PRIOR TO CONSTRUCTION. MEASUREMENTS SHOULD BE FIELD CONFIRMED BEFORE COMMENCING CONSTRUCTION.

PROJECT NUMBER

7180_BA

DATE

08/19/2025

SCALE

1/4" = 1'-0"

SHEET

3 OF 4

A30

LEGEND

FINISHED GRADE LINE

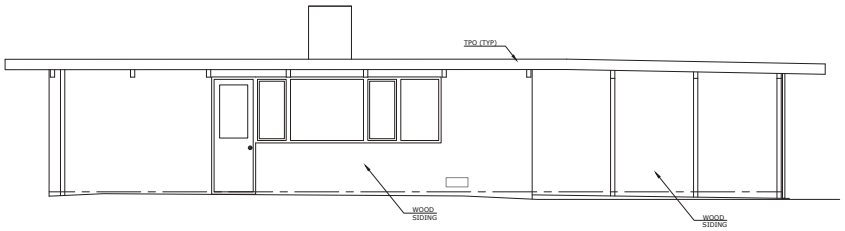
FINISHED FLOOR LINE

F.F.E.= FINISHED FLOOR ELEVATION

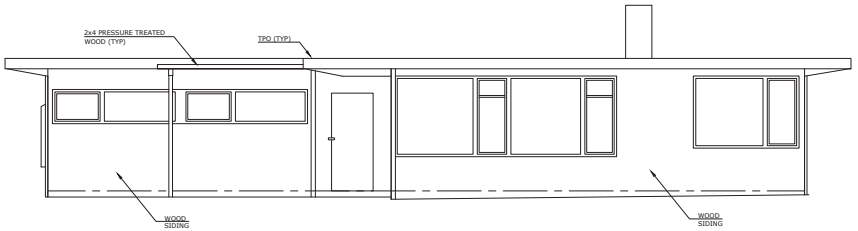
T.O.= TOP OF

ROOF PITCH LABEL (RISE:RUN) X:12

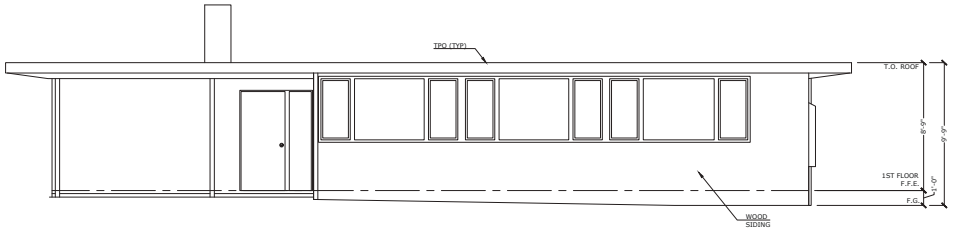
F.G.= FINISHED GRADE



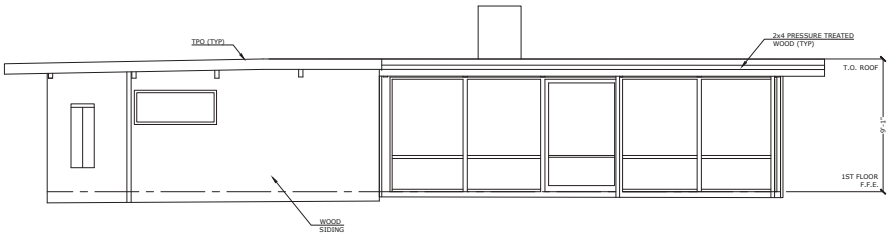
NORTHEAST



SOUTHEAST



NORTHWEST



SOUTHWEST

PRECISION PROPERTY MEASUREMENTS

PREPARED FOR: ALICIA WILSON

PROJECT NAME: 365 ARDEN ROAD PROJECT
MENLO PARK, CA

PLAN TYPE: EXTERIOR ELEVATIONS

ALL SITE PLANS CREATED BY PRECISION PROPERTY MEASUREMENT LTD "PPM" ARE MADE EXCLUSIVELY FOR LANDSCAPING PURPOSES (CAL. BUS. & PROF. CODE §8727), & DO NOT INVOLVE THE DETERMINATION OF ANY PROPERTY LINE, & AS SUCH DO NOT CONSTITUTE LAND SURVEYING (CAL. BUS. & PROF. CODE §§8726-8727). IN ADDITION, PPM SERVICES & PLANS DO NOT CONSTITUTE CIVIL ENGINEERING (CAL. BUS. & PROF. CODE §§6702-6704), & THUS SHOULD NOT BE USED FOR ANY STUDIES OR ACTIVITIES DEFINED AS CIVIL ENGINEERING (CAL. BUS. & PROF. CODE §6731). ALL FLOOR PLANS CREATED BY PPM ARE INTENDED TO BE USED AS A REFERENCE FOR DESIGN & CONSTRUCTION & SHOULD NOT BE CONSIDERED A SUBSTITUTE FOR THE SERVICES OF A LICENSED STRUCTURAL ENGINEER OR LICENSED ARCHITECT. PPM MAKES EVERY REASONABLE EFFORT TO ENSURE THE ACCURACY OF THE INFORMATION FOUND IN OUR PLANS. HOWEVER, EVERY AS-BUILT DRAWING INHERENTLY CONTAINS ERRORS TO SOME DEGREE. IT IS THE DUTY OF THE ARCHITECT, CONTRACTOR, DESIGNER OR OTHER LICENSED PROFESSIONAL, AS A CONSULTANT TO THE PROPERTY OWNER, TO DETERMINE THE SUITABILITY OF THE AS-BUILT PLANS PRIOR TO CONSTRUCTION. MEASUREMENTS SHOULD BE FIELD CONFIRMED BEFORE COMMENCING CONSTRUCTION.

PROJECT NUMBER: 7180_BA

DATE: 08/19/2025

SCALE: 1/4" = 1'-0"

SHEET: 4 OF 4

365 Arden Road
Project Description
September 30, 2025 (rev. 12.8.25)

PARCEL GENERAL INFORMATION

365 Arden Road is a 9.019 SF lot located on the intersection

There were a total of 11 trees inventoried. Of these 11 trees, 6 are heritage trees. We are proposing the removal of 3 non-heritage trees and 1 heritage tree. We are proposing to re-plant 5 new trees.

EXISTING HOME TO BE DEMOLISHED

The existing structures on the site include an 1,650 SF single-story single-family home built in 1951.

PROPOSED SINGLE FAMILY RESIDENCE

The proposed home is a two-story single-family residence in a Traditional style elevation. The home is proposed to have lap siding as an exterior finish. The home propose single-hung gridded windows. The existing neighborhood shows a mixture of architectural styles. Existing homes in the neighborhood are clad with a stucco and siding as common exterior materials, and gridded windows are also featured throughout. We feel our proposed home will fit well within the existing context. The new home will have 4 bedrooms and 3.5 bathrooms, as well as 1 ADU bedroom and 1 ADU bathroom.

NEIGHBOR RELATIONS

We have reached out to neighbors within 300 ft of this property with a copy of the site plan, floor plan, elevations, and a letter addressing our project.

We hosted a neighbor meeting on November 5, 2025. No neighbors attended.

I received an email on November 24, 2025 from our project planner forwarding me an email sent from neighbors at 375 Arden Road. They voiced concerns regarding our windows. As the right side neighbor to 365 Arden, they were concerned about the windows on the right elevation of our home. They indicated that we were proposing 13 windows on our side of the property, finding this to be excessive. They indicated that the 2 windows on the stairway were “offensive and unacceptable to [them]” as it provided a full view into their backyard, patio, and family room their French doors that face their backyard.

We responded back on December 8, 2025 to clarify that there are 12 windows on the right elevation and the 13th window is a door. The majority of the windows are on the first floor and will be blocked by the fence that the property will share. We explained that 4 of these 12 windows are for the stairwell, and 2 of these 4 windows are clerestory and therefore are meant for sunlight. We clarified there is no platform for anyone to look out of.

We also explained that of these 12 windows, only 1 of them look out of the 2nd story. The window looks out of the tub of the master bathroom, so there is minimal foot traffic in that area to look out the window. We explained that our intention is not impede on their privacy but we are proposing a 2nd story home, and the 2nd story needs windows. See attachment 1 for email conversation.

Sincerely,

Hannah Chiu
Planning Manager
hchiu@tjh.com| (650) -392-3573

Attachments
Attachment 1- 375 Arden Road neighbor correspondence.

ATTACHMENT 1

Hannah Chiu

From: Hannah Chiu
Sent: Monday, December 8, 2025 4:16 PM
To: bob_riderjr@yahoo.com
Cc: Matthew Ball
Subject: RE: New construction at 365 Arden Road

Hello Bob,

My name is Hannah Chiu, applicant of 365 Arden Road.

Matthew Ball forwarded me your inquiry below.

Thank you for reaching out. Regarding your concerns about the windows I just wanted to clarify, we are proposing a total of 12 windows. The last window you are counting is a door.

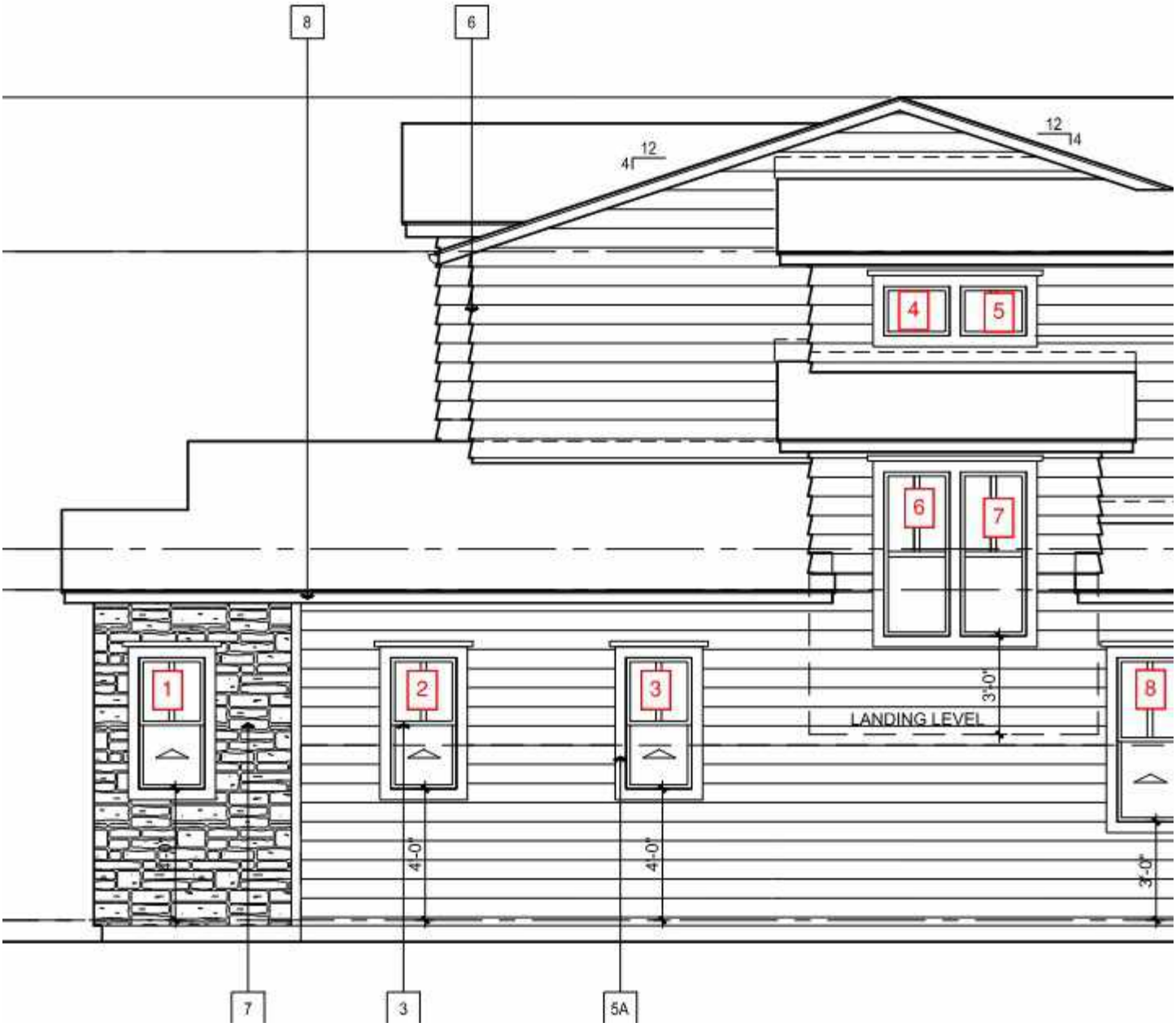
The majority of the windows on the right elevation are on the 1st floor, which will be blocked by the fence that will be placed between our properties.

Also, Windows 4, 5, 6, and 7 are from the stairwell, so there will be minimal traffic in those areas looking outward. Also, windows 4, and 5 are clerestory windows. These windows are set high up on the ceiling near the roofline and are only meant to bring sunlight into the home. There is no platform for anyone to be able to look out of these windows.

I feel that this elevation, window-wise, is actually quite reasonable as there is only one 2nd story window that faces your property. This window is above the tub in the master bathroom, so once again there is minimal traffic in this area and it is set at a 4' sill height.

We don't have any intention to impede on your privacy, but we are proposing a 2nd story home and we need to provide windows on the 2nd story.

Once again, thanks for reaching out regarding your concerns.



Hannah Chiu
Forward Planning Manager, Northern California Division

Thomas James Homes
275 Shoreline Dr. Suite 400, Redwood City, CA, 94065
Office: (650) 392-3573 | TJH.com

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This email and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they are addressed.

From: Bob Rider <bob_riderjr@yahoo.com>
Sent: Monday, November 10, 2025 10:20 AM
To: Matthew Ball <mhball@menlopark.gov>
Subject: New construction at 365 Arden Road

Hi Matthew,

We appreciate the opportunity to voice our strong concerns with the proposed plan to demolish the existing one-story home that is on a substandard lot adjacent to our property at 375 Arden Road. I have carefully reviewed the Thomas James Homes plans for new construction at 365 Arden Road and have some significant concerns. They are proposing 13 windows on the side of their property that directly impacts our home. That is excessive. More importantly, there are two windows on the stairway that are offensive and unacceptable to us. They will completely impinge upon our privacy and peaceful enjoyment of our home. These windows will provide a full view of our backyard and patio (from both the landing and second floor), as well as a direct line of sight into our family room through our French doors that face our backyard. Felton Gables is a very tight knit neighborhood and one that values privacy, community values and a sense of security. We request that the builder remove the windows in the stairway and remove other windows on our side of the property so that we can continue to maintain a sense of privacy.

Thank you for your time and consideration.

Regards,

Bob Rider
375 Arden Road

California Tree and Landscape Consulting, Inc.
411 Grass Valley Hwy, #1050, Auburn, CA 95603 (530) 745-4086

September 23, 2025

Andy Cost, VP of Land Development, N. California District
Thomas James Homes
275 Shoreline Drive, Suite 400
Redwood City, California 94065
Via Email: acost@tjh.com

PROGRESS ARBORIST REPORT, TREE INVENTORY, CONSTRUCTION IMPACT ASSESSMENT & TREE PROTECTION PLAN

RE: 365 Arden Road, City of Menlo Park, California [APN 061-323-020]

EXECUTIVE SUMMARY

Thomas James Homes contacted California Tree and Landscape Consulting, Inc. to document the trees on the property for a better understanding of the existing resource and any potential improvement obstacles that may arise. Thomas James Homes requested an Arborist Report and Tree Inventory suitable for submittal to the City of Menlo Park. This is a Progress Arborist Report, Tree Inventory, Construction Impact Assessment and Tree Protection Plan for the initial filing of plans to develop the property. This evaluation does not include a review of Civil plans which were not available at the time of this review.

Thomas M. Stein, ISA Certified Arborist #WE-12854A, visited the property on July 16, 2025, to provide species identification, measurements of DBH and canopy, field condition notes, recommended actions, ratings, and approximate locations for the trees. A total of 11 trees were evaluated, 6 of which are protected trees according to the City of Menlo Park Municipal Code, Chapter 13.24. [1] Two trees are located off the parcel but were included in the inventory because they may be impacted by development of the parcel.

TABLE 1: Tree Inventory Summary

Tree Species	Total Trees Inventoried	Trees on this Site[2]	Protected Heritage Oak Trees	Protected Heritage Other Trees	Street Tree	Total Proposed for Removal	Total Proposed for Retention
Blackwood acacia, *Acacia melanoxylon*	1	1	0	1	0	1	0

[1] Any tree protected by the City's Municipal Code will require replacement according to its appraised value if it is damaged beyond repair as a result of construction. In addition, any time development-related work is recommended to be supervised by a Project Arborist, it must be written in the report to describe the work plan and mitigation work. The Project Arborist shall provide a follow-up letter documenting the mitigation has been completed to specification.

[2] CalTLC, Inc. is not a licensed land surveyor. Tree locations are approximate and we do not determine tree ownership. Trees which appear to be on another parcel are listed as off-site and treated as the property of that parcel.

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Tree Species	Total Trees Inventoried	Trees on this Site[2]	Protected Heritage Oak Trees	Protected Heritage Other Trees	Street Tree	Total Proposed for Removal	Total Proposed for Retention
California bay laurel, *Umbellularia californica*	3	2	0	1	0	1	2
Coast live oak, *Quercus agrifolia*	1	1 (1 *may* be offsite)	1	0	0	0	1
Coast redwood, *Sequoia sempervirens*	1	1	0	1	0	0	1
English walnut, *Juglans regia*	1	1	0	0	0	0	1
Japanese cheesewood, *Pittosporum tobira*	1	1	0	0	0	1	0
Laurel, *Laurus sp.*	1	1	0	0	0	1	0
London plane tree, *Platanus x hispanica*	1	0	0	1	0	0	1
Privet, *Ligustrum sp.*	1	1	0	1	0	1	0
TOTAL	**11**	**9 (1 *may* be offsite)**	**1**	**5**	**0**	**5**	**6**

ASSIGNMENT

Perform an examination of the site to document the presence and condition of trees protected by the City of Menlo Park. The study area for this effort includes the deeded parcel as delineated in the field by the property fences and any significant or protected trees overhanging from adjacent parcels.

Prepare a report of findings. All trees protected by the City of Menlo Park are included in the inventory.

METHODS

Appendix 2 in this report is the detailed inventory and recommendations for the trees. The following terms and Table A – Ratings Descriptions will further explain our findings.

The protected trees evaluated as part of this report have a numbered tag that was placed on each one that is 1-1/8" x 1-3/8", green anodized aluminum, "acorn" shaped, and labeled: CalTLC, Auburn, CA with 1/4" pre-stamped tree number and Tree Tag. They are attached with a nail, installed at approximately 6 feet above ground level on the approximate north side of the tree. The tag should last ~10-20+ years depending on the species, before it is enveloped by the trees' normal growth cycle.

The appraisals included in this report (see Appendix 4) is based on the 10th Edition of the *Guide for Plant Appraisal*.[3] The trunk formula technique of appraisal provides a basic cost to replace a tree, determined by its species and size. The tree costs are extrapolated from that of the most commonly available and used tree for landscaping, which at this time in

[3] 2018. Council of Tree and Landscape Appraisers. *Guide for Plant Appraisal*, 10th Edition, 2nd Printing. International Society of Arboriculture, Atlanta, GA

Northern California has been determined to be a 24" box specimen.[4] Based on the size and value of the tree as a 24" box, the species are valued at $62.82 to $92.81 per square inch of trunk area. Per the request of the city of Menlo Park, multi-stem trees are measured as a single trunk, just below the lowest point of branching.

The basic value is depreciated by the tree's condition, which is considered a function of its health, structure and form and expressed as a percentage of the basic value. The result is termed the deterioration of the tree.

The trees are further depreciated by the functional and external limitations that may impact their ability to grow to their normal size, shape and function. Functional limitations include limited soil volume, adequate growing space, poor soil quality, etc. External limitations include easements, government regulations and ownership issues beyond the control of the tree's owner.

The final value is rounded to the nearest $100 to obtain the assignment result. If the tree is not a complete loss, the value of loss is determined as a percentage of the original value.

TERMS

Species of trees is listed by our local common name and botanical name by genus and species.

DBH (diameter breast high) is normally measured at 4'6" (54" above the average ground height, but if that varies then the location where it is measured is noted here. A steel diameter tape was used to measure the trees.

Canopy radius is measured in feet. It is the farthest extent of the crown composed of leaves and small twigs measured by a steel tape. This measurement often defines the Critical Root Zone (CRZ) or Protection Zone (PZ), which is a circular area around a tree with a radius equal to this measurement.

Actions listed are recommendations to improve health or structure of the tree. Trees in public spaces require maintenance. If a tree is to remain and be preserved, then the tree may need some form of work to reduce the likelihood of failure and increase the longevity of the tree. Preservation requirements and actions based on a proposed development plan are not included here.

Arborist Rating is subjective to condition and is based on both the health and structure of the tree. All of the trees were rated for condition, per the recognized national standard as set up by the Council of Tree and Landscape Appraisers and the International Society of Arboriculture (ISA) on a numeric scale of 5 (being the highest) to 0 (the worst condition, dead). The rating was done in the field at the time of the measuring and inspection.

Table A – Ratings Descriptions

No problem(s)	5	excellent
No apparent problem(s)	4	good
Minor problem(s)	3	fair
Major problem(s)	2	poor
Extreme problem(s)	1	hazardous, non-correctable
Dead	0	dead

Rating #0: This indicates a tree that has no significant sign of life.

Rating #1: The problems are extreme. This rating is assigned to a tree that has structural and/or health problems that no amount of work or effort can change. The issues may or may not be considered a dangerous situation.

[4] 2004. *Western Chapter Species Classification and Group Assignment.* Western Chapter, International Society of Arboriculture. Porterville, CA

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Rating #2: The tree has major problems. If the option is taken to preserve the tree, its condition could be improved with correct arboricultural work including, but not limited to: pruning, cabling, bracing, bolting, guying, spraying, mistletoe removal, vertical mulching, fertilization, etc. If the recommended actions are completed correctly, hazard can be reduced and the rating can be elevated to a 3. If no action is taken the tree is considered a liability and should be removed.

Rating #3: The tree is in fair condition. There are some minor structural or health problems that pose no immediate danger. When the recommended actions in an arborist report are completed correctly the defect(s) can be minimized or eliminated.

Rating #4: The tree is in good condition and there are no apparent problems that a Certified Arborist can see from a visual ground inspection. If potential structural or health problems are tended to at this stage future hazard can be reduced and more serious health problems can be averted.

Rating #5: No problems found from a visual ground inspection. Structurally, these trees have properly spaced branches and near perfect characteristics for the species. Highly rated trees are not common in natural or developed landscapes. No tree is ever perfect especially with the unpredictability of nature, but with this highest rating, the condition should be considered excellent.

Notes indicate the health, structure and environment of the tree and explain why the tree should be removed or preserved. Additional notes may indicate if problems are minor, extreme or correctible.

Remove is the recommendation that the tree be removed. The recommendation will normally be based either on poor structure or poor health and is indicated as follows:

Yes H – Tree is unhealthy
Yes S – Tree is structurally unsound

OBSERVATIONS AND CONCLUSIONS

The site is located in an existing subdivision with single-family residences, and the vegetation is comprised of ornamental landscape plants in various conditions. The existing single-story home has a reported area of 1,630 sq. ft. and an estimated lot size of 9,000 sq. ft. The home is connected to electrical, communication, gas, water, and sanitary sewer infrastructure. The development plans are pending. Refer to Appendix 2 – Tree Data for details

RECOMMENDED REMOVALS OF HAZARDOUS, DEFECTIVE OR UNHEALTHY TREES

At this time, 1 tree on the property has been recommended for removal from the proposed project area due to the nature and extent of defects, compromised health, and/or structural instability noted at the time of field inventory efforts. If this tree was retained within the proposed project area, it is our opinion that it may be hazardous depending upon its proximity to planned development activities. For reference, the tree which has been recommended for removal is highlighted in green within the accompanying Tree Data (Appendix 2) and briefly summarized as follows:

Tree #	Tag #	Heritage Oak Tree 31.4"+ circ.	Heritage Other Tree 47.1"+ circ.	Street Tree	Off-site	Common Name	Botanical Name	DBH (in.)	Circ. (ft.)	Diameter Measured At (in.)	Arborist Rating
1	5606	No	No	No	No	Laurel	*Laurus sp.*	11	34.6	54	1-Extreme Structure or Health Problems

CONSTRUCTION IMPACT ASSESSMENT

This Arborist Report and Tree Inventory is intended to provide to Thomas James Homes, the City of Menlo Park, and other members of the development team a detailed *pre-development review* of the species, size, and current structure and vigor of the trees within and/or overhanging the proposed project area. At this time, we have reviewed the Architectural Plan prepared by KTGY, dated August 26, 2025 and the Landscape Improvement Plans prepared by Sketch

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& Field, dated August 26, 2025. No civil plans were available for this review. The perceived impacts to inventoried trees are summarized below.

Tree #1 (Tag #5606): The developer proposes removal of this tree.

Tree #2 (Tag #5607): The developer proposes removal of this tree.

Tree #3: (Tag #5608): Minor encroachment for landscaping and a portion of the house foundation which falls 22' from the tree.

Tree #4 (Tag #5609): Moderate encroachment for front yard landscaping and a portion of the house which falls ~35' from the trunk.

Tree #5 (Tag #5610): The developer proposes removal of this tree.

Tree #6 (Tag #5611): Minor encroachment for landscaping, mulch installation.

Tree #7 (Tag #5612): The developer proposes removal of this tree.

Tree #8 (Tag #5613): Minor encroachment for house foundation and landscaping. The house falls ~ 11" from the trunk.

Tree #9 (Tag #5614): The developer proposes removal of this tree.

Tree #10 (Tag #5615): Negligible encroachment for landscaping.

Tree #11 (Tag #5616): Moderate encroachment for landscaping & home construction. Foundation falls ~8' from trunk. Minor to moderate reduction pruning will be necessary for clearance. Foundation impacts will be minor, previous exploratory trench in this area exposed minor root conflicts.

A final inspection by the City Arborist is required at the end of the project. This is to be done before the tree protection fencing is removed. Replacement trees should be planted prior to inspection.

Prior to issuance of the associated demolition and building permits, a tree protection verification letter from the Project Arborist is required. Verification should be performed with a site visit. The Project Arborist should verify that the tree protection is installed in compliance with the recommendations in the arborist report. Photographs should be included in a brief verification letter for City Arborist review. The Project Arborist must provide monthly tree protection monitoring inspections. During these inspections, the Project Arborist should monitor the condition of the trees, verify that the tree protection measures are in compliance, provide recommendations for any necessary maintenance and impact mitigation, and prepare monthly reports for City Arborist Review.

Any tree protected by the City's Municipal Code will require replacement according to its appraised value if it is damaged beyond repair as a result of construction. Any time development-related work is recommended to be supervised by a Project Arborist, it must be written in the report to describe the work plan and mitigation work. The Project Arborist shall provide a follow-up letter documenting the mitigation has been completed to specification.

DISCUSSION

Trees need to be protected from normal construction practices if they are to remain healthy and viable on the site. Our recommendations are based on experience, and County ordinance requirements, so as to enhance tree longevity. This

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requires their root zones remain intact and viable, despite heavy equipment being on site, and the need to install foundations, driveways, underground utilities, and landscape irrigation systems. Simply walking and driving on soil has serious consequences for tree health.

Following is a summary of Impacts to trees during construction and Tree Protection measures that should be incorporated into the site plans in order to protect the trees. Once the plans are approved, they become the document that all contractors will follow. ***The plans become the contract between the owner and the contractor, so that only items spelled out in the plans can be expected to be followed. Hence, all protection measures, such as fence locations, mulch requirements and root pruning specifications must be shown on the plans.***

RECOMMENDATIONS: SUMMARY OF TREE PROTECTION MEASURES

Hire a Project Arborist to help ensure protection measures are incorporated into the site plans and followed. The Project Arborist should, in cooperation with the Engineers and/or Architects:

- Identify the Root Protection Zones on the final construction drawings, prior to bidding the project.
- Show the placement of tree protection fences, as well as areas to be irrigated, fertilized and mulched on the final construction drawings.
- Clearly show trees for removal on the plans and mark them clearly on site. A Contractor who is a Certified Arborist should perform tree and stump removal. All stumps within the root zone of trees to be preserved shall be ground out using a stump router or left in place. **No trunk within the root zone of other trees shall be removed using a backhoe or other piece of grading equipment**.
- Prior to any grading, or other work on the site that will come within 50’ of any tree to be preserved:
    1. Irrigate (if needed) and place a 6” layer of chip mulch over the protected root zone of all trees that will be impacted.
    2. Erect Tree Protection Fences. Place boards against trees located within 3’ of construction zones, even if fenced off.
    3. Remove lower foliage that may interfere with equipment PRIOR to having grading or other equipment on site. The Project Arborist should approve the extent of foliage elevation, and oversee the pruning, performed by a contractor who is an ISA Certified Arborist. All tree maintenance activities shall be performed following the most current American National standards Institute (ANSI) standards for tree maintenance operations and all International Society of Arboriculture Best Management Practices. Typical maintenance pruning consists of clearance pruning, removal of dead branches 1" in diameter and larger and end weight reduction or length reduction as appropriate.
- For grade cuts, expose roots by hand digging, potholing or using an air spade and then cut roots cleanly prior to further grading outside the tree protection zones.
- For fills, if a cut is required first, follow as for cuts.
- Where possible, specify geotextile fabric and/or thickened paving, re-enforced paving, and structural soil in lieu of compacting, and avoid root cutting as much as possible, prior to placing fills on the soil surface. Any proposed retaining wall or fill soil shall be discussed with the engineer and arborist in order to reduce impacts to trees to be preserved.
- Clearly designate an area on the site outside the drip line of all trees where construction materials may be stored, and parking can take place. No materials or parking shall take place within the root zones of protected trees.

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- Design utility and irrigation trenches to minimize disturbance to tree roots. Where possible, dig trenches with hydro-vac equipment or air spade, placing pipes underneath the roots, or bore the deeper trenches underneath the roots.
- Include on the plans an Arborist inspection schedule to monitor the site during (and after) construction to ensure protection measures are followed and make recommendations for care of the trees on site, as needed.

General Tree protection measures are included as Appendix 3. These measures need to be included on the Site, Grading, Utility and Landscape Plans. A final report of recommendations specific to the plan can be completed as part of, and in conjunction with, the actual plans. This will require the arborist working directly with the engineer and architect for the project. If the above recommendations are followed, the amount of time required by the arborist for the final report should be minimal.

Report Prepared by:

Caroline Nicholas
Arborist Assistant

Project Arborist:

Edwin E. Stirtz
Consulting Arborist
ISA Certified Arborist #WE-0510AM, TRAQ

Enc.: Appendix 1 – Tree Protection Plan
Appendix 2 – Tree Data
Appendix 3 – General Practices for Tree Protection
Appendix 4 – Appraisal Value Table
Appendix 5 – Tree Protection Specifications
Appendix 6 – Photographs

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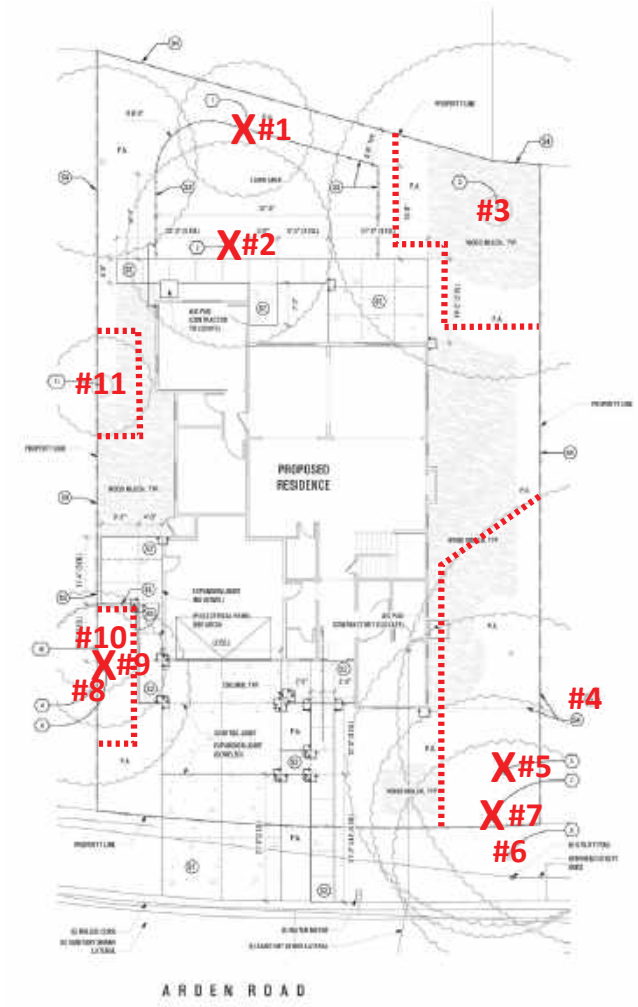


SEE ARBORIST REPORT FOR ADDITIONAL DETAILS

Tree #	Common Name	DBH (in.)	Dev. Status
1	Laurel	11	Remove
2	Blackwood acacia	17	Remove
3	Coast redwood	61	Retain
4	London plane tree	20	Retain
5	Privet	16	Remove
6	English walnut	14	Retain
7	Japanese cheesewood	11	Remove
8	California bay laurel	15	Retain
9	California bay laurel	13	Remove
10	California bay laurel	11	Retain
11	Coast live oak	44	Retain

TREE PROTECTION GENERAL REQUIREMENTS

1. The Project Arborist for this project is California Tree & Landscape Consulting. Contact the Project Arborist at (530) 745-4086. The project arborist may continue to provide expertise and make additional recommendations during the construction process if and when additional impacts occur or tree response is poor. Monitoring and construction oversight by the project arborist is recommended for all projects and required when a final letter of assessment is required by the jurisdiction.

2. The Project Arborist should inspect the exclusionary root protection fencing installed by the contractor prior to any grading and/or grubbing for compliance with the recommended protection zones. Additionally, the project arborist shall inspect the fencing at the onset of each phase of construction. The protection zone for trees is specified as the 'canopy radius' in Appendix 2 unless otherwise specified in the preservation requirements. The location of the tree protection fencing shall be depicted on the plans pursuant to the arborist recommendations. Note 'dripline' is not an acceptable location for installation of tree protection fencing.

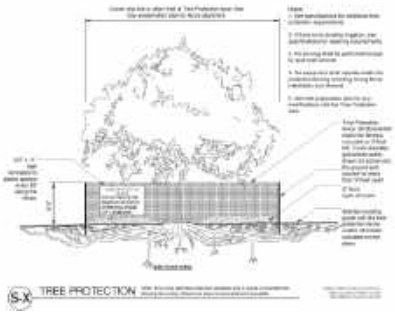
3. The Project Arborist should directly supervise any clearance pruning, irrigation, fertilization, placement of mulch and/or chemical treatments. If clearance pruning is required, the Project Arborist should approve the extent of foliage elevation and oversee the pruning to be performed by a contractor who is an ISA Certified Arborist. Clearance pruning should include removal of all the lower foliage that may interfere with equipment PRIOR to having grading or other equipment on site.

4. No trunk within the root protection zone of any trees shall be removed using a backhoe or other piece of grading equipment.

5. Clearly designate an area on the site outside the drip line of all trees where construction materials may be stored, and parking can take place. No materials or parking shall take place within the root zones of protected trees.

6. Any and all work to be performed inside the protected root zone fencing, including all grading and utility trenching, shall be approved and/or supervised by the Project Arborist.

7. Trenching, if required, inside the protected root zone shall be approved and/or supervised by the Project Arborist and may be required to be by a hydraulic or air spade, placing pipes underneath the roots, or boring deeper trenches underneath the roots.



California Tree & Landscape Consulting, Inc.

411 Grass Valley Hwy #1050
Auburn, CA 95603

TREE PROTECTION PLAN

X = Removals

Tree Protection Fencing

Sheet No. 1

365 Arden Road

City of Menlo Park, CA

Prepared for: Thomas James Homes

Date: 9/10/2025

APPENDIX 2 – TREE DATA

Tree #	Tag #	Heritage Oak Tree 31.4"+ circ.	Heritage Other Tree 47.1"+ circ.	Street Tree	Off-site	Common Name	*Species*	DBH (in.)	DBH Multi Stem (in.)*	Circ. (in.)	Measured At (in.)	Measured Canopy Radius (ft.)	Tree Height (ft)	Arborist Rating	Notes	Recommen-dations	Construction Impact	Protective Measures to be Taken	Appraised Value, Rounded ($)	Suitability for Preservation	Justification for Removal
1	5606	No	No	No	No	Laurel	*Laurus sp.*	11	5,6	34.6	54	11	15	1-Extreme Structure or Health Problems	Flare obscured by landscape. Codominant branching at 1 foot above grade. 6 inch stem is dead with decay. Moderate lean west from grade without correction.	Recommend removal. Will not be an asset in the new landscape.	To be removed.	N/A	N/A	Poor	Poor condition
2	5607	No	Yes	No	No	Blackwood acacia	*Acacia melanoxylon*	17		53.4	54	17	40	3-Minor Problems	Flare normal. Exposed roots to the west with mechanical damage and decay. Lateral branching at 10 feet. Good branch spacing. Slight lean Northwest. Located 15.5 feet southeast of existing home.	Will present development issues if retained due to location; may require moderate clearance pruning.	To be removed.	N/A	$9,000.00	Fair	Undesirable species
3	5608	No	Yes	No	No	Coast redwood	*Sequoia sempervirens*	61		191.6	54	28	70	3-Minor Problems	Partially buried flare. Uneven grade. Good branch spacing. Overextended branches. Minor amount of dead foliage. Located 34 feet from existing home and about 8 feet	May require moderate clearance pruning for development. Perform end weight reduction throughout tree.	Minor encroachment for landscaping and a portion of the house foundation which falls 22' from the tree.	Install protective fencing. Minor clearance pruning. Root impacts TBD.	$93,000.00	Good	N/A

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Tree #	Tag #	Heritage Oak Tree 31.4"+ circ.	Heritage Other Tree 47.1"+ circ.	Street Tree	Off-site	Common Name	*Species*	DBH (in.)	DBH Multi Stem (in.)*	Circ. (in.)	Measured At (in.)	Measured Canopy Radius (ft.)	Tree Height (ft)	Arborist Rating	Notes	Recommen-dations	Construction Impact	Protective Measures to be Taken	Appraised Value, Rounded ($)	Suitability for Preservation	Justification for Removal
															from property corner.						
4	5609	No	Yes	No	Yes	London plane tree	*Platanus x hispanica*	20		62.8	54	40	60	3-Minor Problems	All dimensions estimated. Tree only viewed from north east side. Offsite approximately 20 feet west of property line. Tag on fence. Normal flare. Codominant at 8 feet above grade. Overhangs site approximately 20 feet. Wires in canopy. No issues expected with development.		Moderate encroachment for front yard landscaping and a portion of the house which falls ~35' from the trunk.	Install protective fencing. Minor clearance pruning. Root impacts TBD.	$9,100.00	Good	N/A
5	5610	No	Yes	No	No	Privet	*Ligustrum sp.*	16		50.3	24	26	40	2-Major Structure or health problems	All dimensions estimated. Flare and trunk covered in thick ivy. Lateral branching at 3 feet above grade. Minor amount of dead in upper canopy. Located about 3 feet north of south property line.	Remove ivy and reevaluate.		N/A	$1,700.00	Fair	Undesirable species & poor condition.
6	5611	No	No	No	No	English walnut	*Juglans regia*	14		44	54	19	29	2-Major Structure or health problems	Flare and trunk obscured by thick ivy. Leans moderately northwest from grade,		Minor encroachment for landscaping, mulch installation.	Install protective fencing.	N/A	Fair	N/A

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Tree #	Tag #	Heritage Oak Tree 31.4"+ circ.	Heritage Other Tree 47.1"+ circ.	Street Tree	Off-site	Common Name	*Species*	DBH (in.)	DBH Multi Stem (in.)*	Circ. (in.)	Measured At (in.)	Measured Canopy Radius (ft.)	Tree Height (ft)	Arborist Rating	Notes	Recommen-dations	Construction Impact	Protective Measures to be Taken	Appraised Value, Rounded ($)	Suitability for Preservation	Justification for Removal
															straightening by 10 feet. Utility pole located 5 feet north. Conflict with wires. Overhangs street approximately 11 feet. 8 ft E of valley gutter; no sidewalk. May present development issues.						
7	5612	No	No	No	No	Japanese cheesewood	*Pittosporum tobira*	11		34.6	6	20	15	2-Major Structure or health problems	All dimensions estimated. Flare and lower trunk obscured by thick ivy. Branches at about 1 foot above grade. North scaffold grows horizontally to the north.	Remove ivy and reevaluate. May present development issues.	To be removed.	N/A	N/A	Fair	Undesirable species & poor condition.
8	5613	No	Yes	No	Yes	California bay laurel	*Umbellularia californica*	15		47.1	12	16	25	3-Minor Problems	All dimensions estimated. Flare and lower trunk obscured by heavy ivy. Moderate lean SW at 6 ft. Overhangs site 15 ft. Moderate amount of dead limbs throughout. No issues with development.		Minor encroachment for house foundation and landscaping. The house falls ~ 11" from the trunk.	Install protective fencing. Minor clearance pruning. Root impacts TBD.	$2,300.00	Fair	N/A

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Tree #	Tag #	Heritage Oak Tree 31.4"+ circ.	Heritage Other Tree 47.1"+ circ.	Street Tree	Off-site	Common Name	*Species*	DBH (in.)	DBH Multi Stem (in.)*	Circ. (in.)	Measured At (in.)	Measured Canopy Radius (ft.)	Tree Height (ft)	Arborist Rating	Notes	Recommen-dations	Construction Impact	Protective Measures to be Taken	Appraised Value, Rounded ($)	Suitability for Preservation	Justification for Removal
9	5614	No	No	No	No	California bay laurel	*Umbellularia californica*	13		40.8	12	10	30	2-Major Structure or health problems	All dimensions estimated. Flare and trunk covered by ivy. Moderate lean southwest from grade. Minor die back in upper canopy. Flagged tag on W side.	Remove ivy and reevaluate.	To be removed.	N/A	N/A	Fair	Poor condition.
10	5615	No	No	No	No	California bay laurel	*Umbellularia californica*	11		34.6	54	7	3	2-Major Structure or health problems	All dimensions estimated. Flare and trunk covered by ivy. Moderate lean southwest from grade. Minor die back in upper canopy. Tagged with flagging on south side.	Remove ivy and reevaluate.	Negligible encroachment for landscaping.	Install protective fencing. Reduction prune as necessary to prevent broken branches.	N/A	Fair	N/A
11	5616	Yes	No	No	Unknown	Coast live oak	*Quercus agrifolia*	44		138.2	6	8	55	3-Minor Problems	All dimensions estimated. Shared tree. Flare slightly buried. Codominant at 3 feet above grade with large inclusion. Multiple pruning wounds with good response growth. Out of balance northeast. Project side has had extensive clearance pruning.	Perform aerial inspection and provide further recommendations. Consider cabling tree.	Moderate encroachment for landscaping & home construction. Foundation falls ~8' from trunk. Minor to moderate reduction pruning will be necessary for clearance. Foundation impacts will be minor, previous exploratory trench in this	Install protective fencing. Reduction prune as necessary to prevent broken branches. Monitor excavation within CRZ & root prune as necessary.	$21,600.00	Good	N/A

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Tree #	Tag #	Heritage Oak Tree 31.4"+ circ.	Heritage Other Tree 47.1"+ circ.	Street Tree	Off-site	Common Name	*Species*	DBH (in.)	DBH Multi Stem (in.)*	Circ. (in.)	Measured At (in.)	Measured Canopy Radius (ft.)	Tree Height (ft)	Arborist Rating	Notes	Recommen-dations	Construction Impact	Protective Measures to be Taken	Appraised Value, Rounded ($)	Suitability for Preservation	Justification for Removal
																	area exposed minor root conflicts.				

TOTAL INVENTORIED TREES = 11 trees (732 aggregate circumference inches)
TOTAL RECOMMENDED REMOVALS = 1 tree (35 aggregate circumference inches)
TOTAL RECOMMENDED REMOVALS FOR DEVELOPMENT= 5 trees (214 aggregate circumference inches)
Rating (0-5, where 0 is dead; 666=unprotected): 1=1 tree; 2=5 trees; 3=5 trees
Total Protected Street Trees = None
Total Protected Oak Trees 31.4"+ = 1 tree (138 aggregate circumference inches)
Total Protected Other Trees 47.1"+ = 5 trees (405 aggregate circumference inches)
TOTAL PROTECTED TREES = 6 trees (344 aggregate circumference inches)

*DBH for multi-stem trees was calculated by adding the stems together.

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APPENDIX 3 – GENERAL PRACTICES FOR TREE PROTECTION

Definitions:

Root zone: The roots of trees grow fairly close to the surface of the soil, and spread out in a radial direction from the trunk of tree. A general rule of thumb is that they spread 2 to 3 times the radius of the canopy, or 1 to 1½ times the height of the tree. It is generally accepted that disturbance to root zones should be kept as far as possible from the trunk of a tree.

Inner Bark: The bark on large valley oaks and coast live oaks is quite thick, usually 1" to 2". If the bark is knocked off a tree, the inner bark, or cambial region, is exposed or removed. The cambial zone is the area of tissue responsible for adding new layers to the tree each year, so by removing it, the tree can only grow new tissue from the edges of the wound. In addition, the wood of the tree is exposed to decay fungi, so the trunk present at the time of the injury becomes susceptible to decay. Tree protection measures require that no activities occur which can knock the bark off the trees.

Methods Used in Tree Protection:

No matter how detailed Tree Protection Measures are in the initial Arborist Report, they will not accomplish their stated purpose unless they are applied to individual trees and a Project Arborist is hired to oversee the construction. The Project Arborist should have the ability to enforce the Protection Measures. The Project Arborist should be hired as soon as possible to assist in design and to become familiar with the project. He must be able to read and understand the project drawings and interpret the specifications. He should also have the ability to cooperate with the contractor, incorporating the contractor's ideas on how to accomplish the protection measures, wherever possible. It is advisable for the Project Arborist to be present at the Pre-Bid tour of the site, to answer questions the contractors may have about Tree Protection Measures. This also lets the contractors know how important tree preservation is to the developer.

Root Protection Zone (RPZ): Since in most construction projects it is not possible to protect the entire root zone of a tree, a Root Protection Zone is established for each tree to be preserved. The minimum Root Protection Zone is the area underneath the tree's canopy (out to the dripline, or edge of the canopy), plus 1'. The Project Arborist must approve work within the RPZ.

Irrigate, Fertilize, Mulch: Supplemental irrigation, fertilization and or addition of mulch may be required at some point in time during the course of construction. The project arborist will recommend any or all of these mitigation measures as necessary during the course of construction.

Fence: Fence around the Root Protection Zone and restrict activity therein to prevent soil compaction by vehicles, foot traffic or material storage. The fenced area shall be off limits to all construction equipment, unless there is express written notification provided by the Project Arborist, and impacts are discussed and mitigated prior to work commencing.

> A protective barrier of 6' chain link fence shall be installed around the dripline of protected tree(s). The fencing can be moved within the dripline if authorized by the project arborist or city arborist, but not closer than 2' from the trunk of any tree. Fence posts shall be 8' tall and 2" in diameter. Galvanized posts are to be driven 24" into the ground. The distance between posts shall not be more than 10'. Movable barriers of chain link fencing secured to cement blocks can be substituted for "fixed" fencing if the project arborist and city arborist agree that the fencing will have to be moved to accommodate

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certain phases of construction. The builder may not move the fence without authorization from the project or city arborist.

Where the city or project arborist has determined that tree protection fencing will interfere with the safety of work crews, tree wrap may be used as an alternative form of tree protection. Wooden slats at least 1" thick are to be bound securely, edge to edge, around the trunk. A single layer or more of orange plastic construction fencing is to be wrapped and secured around the outside of the wooden slats. Major scaffold limbs may require protection as determined by the city or project arborist. Straw waddle may also be used as a trunk wrap by coiling waddle around the trunk up to a minimum height of 6' from grade. A single layer or more of orange plastic construction fencing is to be wrapped and secured around the straw waddle.

Signage should be placed on the protective tree fence no further than 30' apart. The signage should present the following information:

- "TREE PROTECTION FENCE – DO NOT MOVE OR REMOVE WITHOUT APPROVAL FROM CITY ARBORIST"
- Storage of building materials or soil is prohibited within the Tree Protection Zone.
- Construction or operation of construction equipment is prohibited within the tree protection zone.

In areas with many trees, the RPZ can be fenced as one unit, rather than separately for each tree.

Do not allow run off or spillage of damaging materials into the area below any tree canopy.

Do not store materials, stockpile soil or park or drive vehicles within the TPZ.

Do not cut, break, skin or bruise roots, branches, or trunks without first obtaining authorization from the city arborist.

Do not allow fires under and adjacent to trees.

Do not discharge exhaust into foliage.

Do not secure cable, chain or rope to trees or shrubs.

Do not trench, dig, or otherwise excavate within the dripline or TPZ of the tree(s) without first obtaining authorization from the city arborist.

Do not apply soil sterilant under pavement near existing trees.

Only excavation by hand, compressed air or hydro-vac shall be allowed within the dripline of trees.

Elevate Foliage: Where indicated, remove lower foliage from a tree to prevent limb breakage by equipment. Low foliage can usually be removed without harming the tree, unless more than 25% of the foliage is removed. Branches need to be removed at the anatomically correct location in order to prevent decay organisms from entering the trunk. For this reason, a contractor who is an ISA Certified Arborist should perform all pruning on protected trees.[5]

Expose and Cut Roots: Breaking roots with a backhoe, or crushing them with a grader, causes significant injury, which may subject the roots to decay. Ripping roots may cause them to splinter toward the base of the tree,

[5] International Society of Arboriculture (ISA), maintains a program of Certifying individuals. Each Certified Arborist has a number and must maintain continuing education credits to remain Certified.

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creating much more injury than a clean cut would make. At any location where the root zone of a tree will be impacted by a trench or a cut (including a cut required for a fill and compaction), the roots shall be exposed with either a backhoe digging radially to the trunk, by hand digging, or by a hydraulic air spade, and then cut cleanly with a sharp instrument, such as chainsaw with a carbide chain. Once the roots are severed, the area behind the cut should be moistened and mulched. A root protection fence should also be erected to protect the remaining roots, if it is not already in place. Further grading or backhoe work required outside the established RPZ can then continue without further protection measures.

Protect Roots in Deeper Trenches: The location of utilities on the site can be very detrimental to trees. Design the project to use as few trenches as possible, and to keep them away from the major trees to be protected. Wherever possible, in areas where trenches will be very deep, consider boring under the roots of the trees, rather than digging the trench through the roots. This technique can be quite useful for utility trenches and pipelines.

Route pipes outside of the area that is 10 times the diameter of the protected tree to avoid conflicts with roots. Where it is not possible to reroute pipes or trenches, the contractor shall bore beneath the dripline of the tree. The boring shall take place not less than 3' below the surface of the soil in order to avoid encountering feeder roots. Alternatively, the trench can be excavated using hand, pneumatic of hydro-vac techniques within the RPZ. The goal is to avoid damaging the roots while excavating. The pipes should be fed under the exposed roots. Trenches should be filled within 24 hours, but where this is not possible the side of the trench adjacent to the trees shall be kept shaded with 4 layers of dampened, untreated burlap, wetted as frequently as necessary to keep the burlap wet.

Protect Roots in Small Trenches: After all construction is complete on a site, it is not unusual for the landscape contractor to come in and sever a large number of "preserved" roots during the installation of irrigation systems. The Project Arborist must therefore approve the landscape and irrigation plans. The irrigation system needs to be designed so the main lines are located outside the root zone of major trees, and the secondary lines are either laid on the surface (drip systems), or carefully dug with a hydraulic or air spade, and the flexible pipe fed underneath the major roots.

Design the irrigation system so it can slowly apply water (no more than ¼" to ½" of water per hour) over a longer period of time. This allows deep soaking of root zones. The system also needs to accommodate infrequent irrigation settings of once or twice a month, rather than several times a week.

Monitoring Tree Health During and After Construction: The Project Arborist should visit the site at least once a month during construction to be certain the tree protection measures are being followed, to monitor the health of impacted trees, and make recommendations as to irrigation or other needs.

Root Structure

The majority of a tree's roots are contained in a radius from the main trunk outward approximately two to three times the canopy of the tree. These roots are located in the top 6" to 3' of soil. It is a common misconception that a tree underground resembles the canopy (see Drawing A below). The correct root structure of a tree is in Drawing B. All plants' roots need both water and air for survival. Surface roots are a common phenomenon with trees grown in compacted soil. Poor canopy development or canopy decline in mature trees is often the result of inadequate root space and/or soil compaction.

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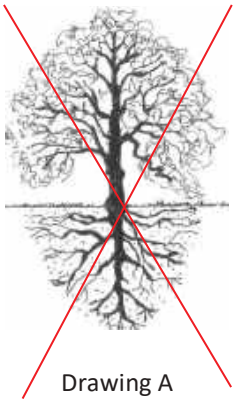
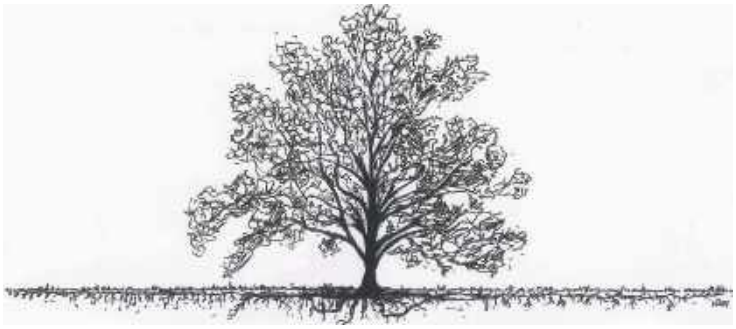


Drawing A
Common misconception of where tree roots are assumed to be located



Drawing B
The reality of where roots are generally located

Structural Issues

Limited space for canopy development produces poor structure in trees. The largest tree in a given area, which is 'shading' the other trees is considered Dominant. The 'shaded' trees are considered Suppressed. The following picture illustrates this point. Suppressed trees are more likely to become a potential hazard due to their poor structure.

Dominant Tree

Growth is upright

Canopy is balanced by limbs and foliage equally



Suppressed Tree

Canopy weight all to one side

Limbs and foliage grow away from dominant tree

Co-dominant leaders are another common structural problem in trees.

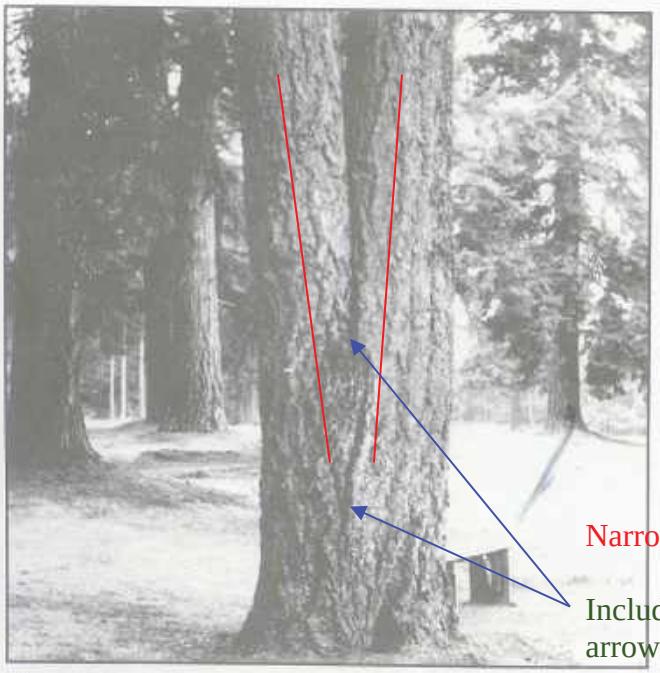


Figure 6. Codominant stems are inherently weak because the stems are of similar diameter.

The tree in this picture has a co-dominant leader at about 3' and included bark up to 7 or 8'. Included bark occurs when two or more limbs have a narrow angle of attachment resulting in bark between the stems – instead of cell to cell structure. This is considered a critical defect in trees and is the cause of many failures.

Narrow Angle

Included Bark between the arrows

Photo from Evaluation of Hazard Trees in Urban Areas by Nelda P. Matheny and James R. Clark, 1994 International Society of Arboriculture

Pruning Mature Trees for Risk Reduction

There are few good reasons to prune mature trees. Removal of deadwood, directional pruning, removal of decayed or damaged wood, and end-weight reduction as a method of mitigation for structural faults are the only reasons a mature tree should be pruned. Live wood over 3" should not be pruned unless absolutely necessary. Pruning cuts should be clean and correctly placed. Pruning should be done in accordance with the American National Standards Institute (ANSI) A300 standards. It is far better to use more small cuts than a few large cuts as small pruning wounds reduce risk while large wounds increase risk.

Pruning causes an open wound in the tree. Trees do not "heal" they compartmentalize. Any wound made today will always remain, but a healthy tree, in the absence of decay in the wound, will 'cover it' with callus tissue. Large, old pruning wounds with advanced decay are a likely failure point. Mature trees with large wounds are a high failure risk.

Overweight limbs are a common structural fault in suppressed trees. There are two remedial actions for overweight limbs (1) prune the limb to reduce the extension of the canopy, or (2) cable the limb to reduce movement. Cables do not hold weight they only stabilize the limb and require annual inspection.



Photo of another tree – not at this site.

Normal limb structure

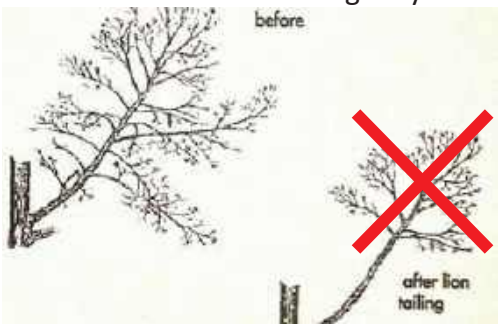
Over weight, reaching limb with main stem diameter small compared with amount of foliage present



Photo of another tree – not at this site

Lion's – Tailing is the pruning practice of removal of "an excessive number of inner and/or lower lateral branches from parent branches. Lion's tailing is not an acceptable pruning practice" ANSI A300 (part 1) 4.23. It increases the risk of failure.

Pruning – Cutting back trees changes their natural structure, while leaving trees in their natural form enhances longevity.





Arborist Classifications

There are different types of Arborists:

Tree Removal and/or Pruning Companies. These companies may be licensed by the State of California to do business, but they do not necessarily know anything about trees;

Arborists. Arborist is a broad term. It is intended to mean someone with specialized knowledge of trees but is often used to imply knowledge that is not there.

ISA Certified Arborist: An International Society of Arboriculture Certified Arborist is someone who has been trained and tested to have specialized knowledge of trees. You can look up certified arborists at the International Society of Arboriculture website: isa-arbor.org.

Consulting Arborist: An American Society of Consulting Arborists Registered Consulting Arborist is someone who has been trained and tested to have specialized knowledge of trees and trained and tested to provide high quality reports and documentation. You can look up registered consulting arborists at the American Society of Consulting Arborists website: https://www.asca-consultants.org/

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Decay in Trees

Decay (in General): Fungi cause all decay of living trees. Decay is considered a disease because cell walls are altered, wood strength is affected, and living sapwood cells may be killed. Fungi decay wood by secreting enzymes. Different types of fungi cause different types of decay through the secretion of different chemical enzymes. Some decays, such as white rot, cause less wood strength loss than others because they first attack the lignin (causes cell walls to thicken and reduces susceptibility to decay and pest damage) secondarily the cellulose (another structural component in a cell walls). Others, such as soft rot, attack the cellulose chain and cause substantial losses in wood strength even in the initial stages of decay. Brown rot causes wood to become brittle and fractures easily with tension. Identification of internal decay in a tree is difficult because visible evidence may not be present.



According to Evaluation of Hazard Trees in Urban Areas (Matheny, 1994) decay is a critical factor in the stability of the tree. As decay progresses in the trunk, the stem becomes a hollow tube or cylinder rather than a solid rod. This change is not readily apparent to the casual observer. Trees require only a small amount of bark and wood to transport water, minerals and sugars. Interior heartwood can be eliminated (or degraded) to a great degree without compromising the transport process. Therefore, trees can contain significant amounts of decay without showing decline symptoms in the crown.



Compartmentalization of decay in trees is a biological process in which the cellular tissue around wounds is changed to inhibit fungal growth and provide a barrier against the spread of decay agents into barrier zones is the formation of the tree may be able to limit decay pruning cuts, in the event that there located vertically along the main trunk of the tree, the likelihood of decay progression and the associated structural loss of integrity of the internal wood is high.

additional cells. The weakest of the vertical wall. Accordingly, while a progression inward at large are more than one pruning cut

Oak Tree Impacts

Our native oak trees are easily damaged or killed by having the soil within the Critical Root Zone (CRZ) disturbed or compacted. All of the work initially performed around protected trees that will be saved should be done by people rather than by wheeled or track type tractors. Oaks are fragile giants that can take little change in soil grade, compaction, or warm season watering. Don't be fooled into believing that warm season watering has no adverse effects on native oaks. Decline and eventual death can take as long as 5-20 years with poor care and inappropriate watering. Oaks can live hundreds of years if treated properly during construction, as well as later with proper pruning, and the appropriate landscape/irrigation design.

APPENDIX 4 – APPRAISAL VALUE TABLE*

Client: Thomas James Homes: Tree Appraisal at 365 Arden Road, Menlo Park

Tree #	DBH (Inch.)	Species	Trunk Area (Inch.^{2})	Unit Cost ($/in^2)	Basic Reproduction Cost ($)	Physical Deterioration	Functional Limitations	External Limitations	Total Depreciation	Depreciated Cost ($)	Rounded Cost ($)	% Loss	Assignment Result ($)
2	17	Blackwood acacia**	226.865	$77.64	$17,614.367	0.6	0.9	1	0.51	$8,983.48	$9,000.00	N/A	$9,000.00
3	61	Coast redwood	2920.985	$58.95	$172,184.38	0.6	1	0.9	0.54	$92,979.56.00	$93,000.00	N/A	$93,000.00
4	20	London plane tree	314	$72.37	$22,723.68	0.5	0.8	1	0.40	$9,089.47	$9,100.00	N/A	$9,100.00
5	16	Privet	200.96	$82.89	$16,658.53	0.3	0.6	0.5	0.10	$1,665.85	$1,700.00	N/A	$1,700.00
8	15	California bay laurel	176.625	$122.77	$21,683.87	0.3	0.5	0.7	0.11	$2,276.81	$2,300.00	N/A	$2,300.00
11	44	Coast live oak	1519.76	$76.32	$115,981.68	0.5	0.5	0.7	0.19	$21,649.91	$21,600.00	N/A	$21,600.00
									Additional Costs			**TBD**	
									Assignment Result (Rounded):				**$136,700.00**

*Replacement tree cost from Urban tree farm 12/24 price list, Fulton CA; does not include tax, site prep or delivery; Tree #5 was valued at $375/ft of trunk height, excluding the fronds.

Nursery group taken from the WCISA Species Classification and Group Assignment "A Regional Supplement to the CLTA Guide for Plant Appraisal, 9th Edition"

**Blackwood acacia is considered undesirable by the City of Menlo Park; alternative species (Gingko biloba) was used for appraisal.

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APPENDIX 5 – TREE PROTECTION SPECIFICATIONS

Insert 5 PDF pages

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APPENDIX 4 – PHOTOGRAPHS by Thomas M. Stein, July 16, 2025



Photo #1, Shows Tag #5606 (Tree #1)



Photo #2, Shows Tag #5607 (Tree #2)

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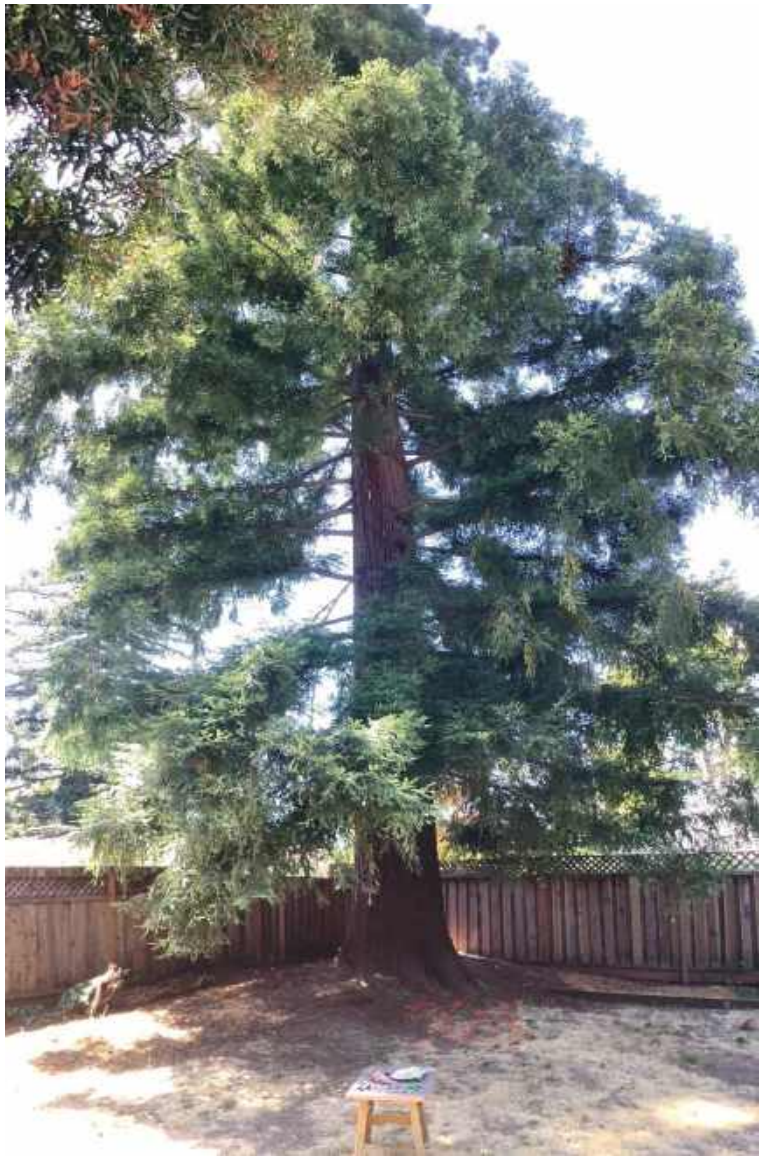



Photos #3 & #4, Show Tag #5608 (Tree #3)

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Photo #5, Shows Tag #5609 (Tree #4)



Photo #6, Shows Tag #5611 (Tree #6)

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Photo #7, Shows Tag #5612 (Tag #7) & Tag #5611 (Tree #6), from left to right



Photo #8, Shows Tag #5608 (Tree #3)

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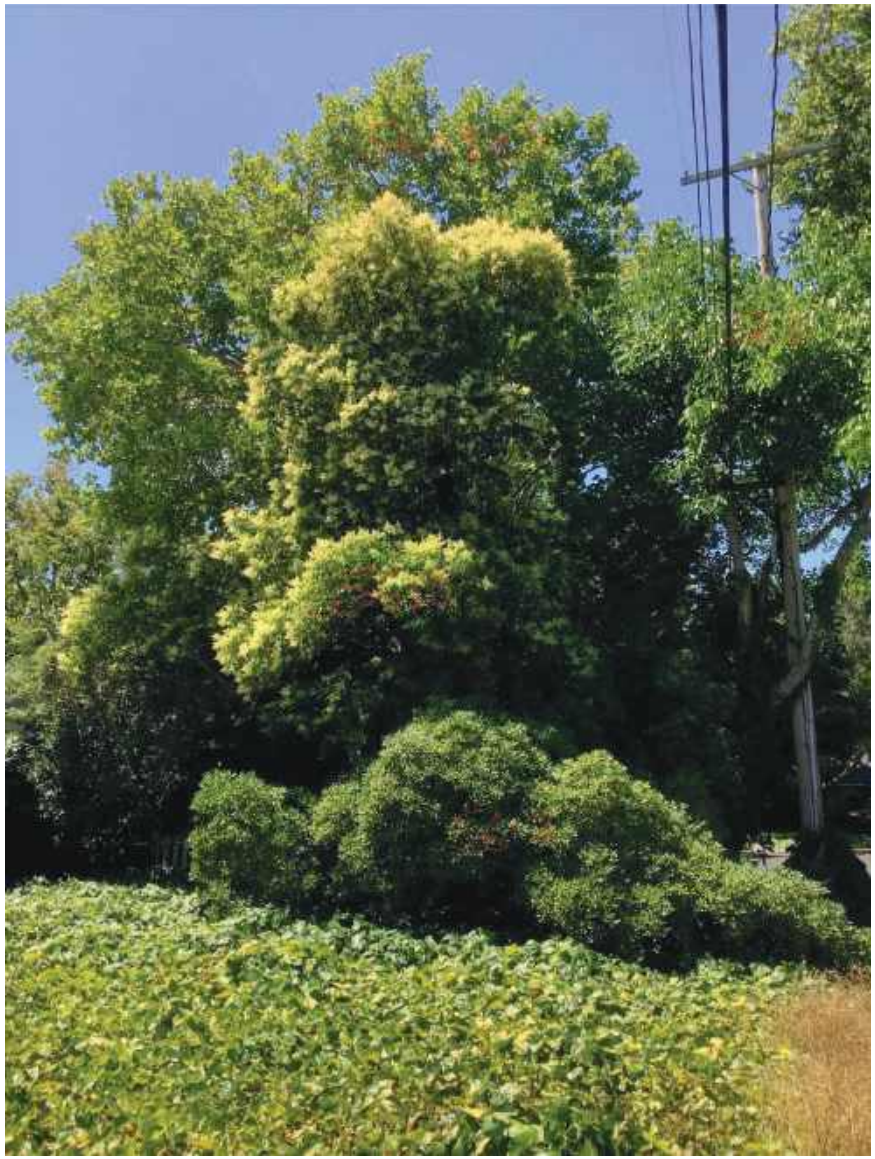

Photo #9, Shows Tag #5610 (Tag #5) & Tag #5612 (Tree #7), from top to bottom



Photo #10, Shows Tag #5613 (Tree #8), Tag #5614 (Tree #9) & Tag #5615 (Tree #10), from left to right

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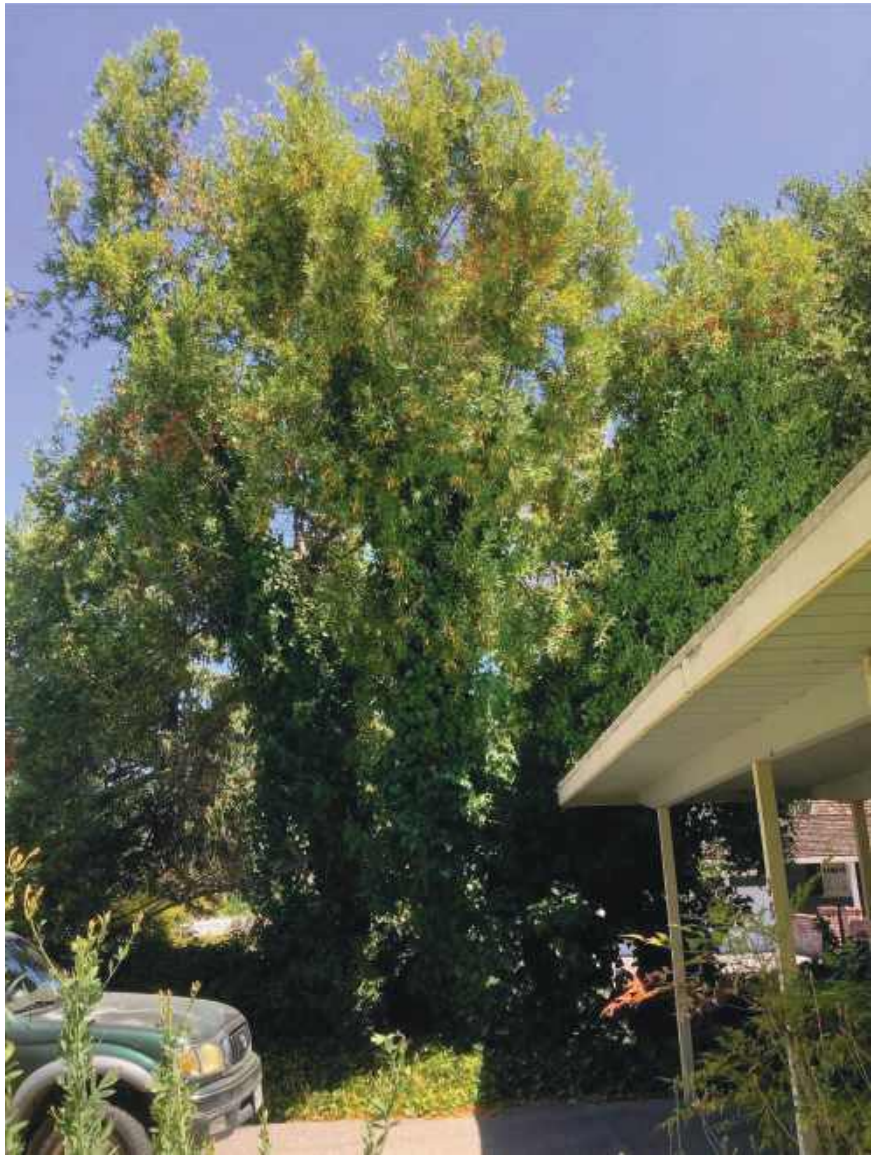

Photo #11, Shows #5613 (Tree #8), Tag #5614 (Tree #9) & Tag #5615 (Tree #10), from left to right



Photo #12, Shows Tag #5616 (Tree #11)

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Photos #13 & #14, Show Tag #5616 (Tree #11)

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Photo #15, Shows Tag #5616 (Tree #11) & Tag #5607 (Tree #2), from left to right



Photo #16, Shows Tag #5616 (Tree #11) & Tag #5608 (Tree #3)

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LOCATION: 365 Arden Road	PROJECT NUMBER: PLN2025-00044	APPLICANT: Hannah Chiu, c/o Thomas James Homes	OWNER: SF21G, LLC

PROJECT CONDITIONS:

1. The use permit shall be subject to the following ***standard*** conditions:
    a. The applicant shall be required to apply for a building permit within one year from the date of approval (by March 9, 2026) for the use permit to remain in effect.
    b. Development of the project shall be substantially in conformance with the plans prepared by ktgy, consisting of 27 plan sheets, dated February 19, 2026, and approved by the Planning Commission on March 9, 2026, except as modified by the conditions contained herein, subject to review and approval of the Planning Division.
    c. Prior to building permit issuance, the applicant shall comply with all Sanitary District, Menlo Park Fire Protection District, and utility companies' regulations that are directly applicable to the project.
    d. Prior to building permit issuance, the applicant shall comply with all requirements of the Building Division, Engineering Division, and Transportation Division that are directly applicable to the project.
    e. Prior to building permit issuance, the applicant shall submit a plan for any new utility installations or upgrades for review and approval by the Planning, Engineering, and Building Divisions. All utility equipment that is installed outside of a building and that cannot be placed underground shall be properly screened by landscaping. The plan shall show exact locations of all meters, back flow prevention devices, transformers, junction boxes, relay boxes, and other equipment boxes.
    f. Simultaneous with the submittal of a complete building permit application, the applicant shall submit plans indicating that the applicant shall remove and replace any damaged and significantly worn sections of frontage improvements. The plans shall be submitted for review and approval of the Engineering Division.
    g. Simultaneous with the submittal of a complete building permit application, the applicant shall submit a Grading and Drainage Plan for review and approval of the Engineering Division. The Grading and Drainage Plan shall be approved prior to the issuance of grading, demolition or building permits
    h. Heritage trees in the vicinity of the construction project shall be protected pursuant to the Heritage Tree ordinance and the arborist report prepared by California Tree and Landscape Consulting Inc., dated September 23, 2025.
    i. Prior to building permit issuance, the applicant shall pay all fees incurred through staff time spent reviewing the application.
    j. The applicant or permittee shall defend, indemnify, and hold harmless the City of Menlo Park or its agents, officers, and employees from any claim, action, or proceeding against the City of Menlo Park or its agents, officers, or employees to attack, set aside, void, or annul an approval of the Planning Commission, City Council, Community Development Director, or any other department, committee, or agency of the City concerning a development, variance, permit, or land use approval which action is brought within the time period provided for in any applicable statute; provided, however, that the applicant's or permittee's duty to so defend, indemnify, and hold harmless shall be subject to the City's promptly notifying the applicant or permittee of any said claim,

LOCATION: 365 Arden Road	PROJECT NUMBER: PLN2025-00044	APPLICANT: Hannah Chiu, c/o Thomas James Homes	OWNER: SF21G, LLC

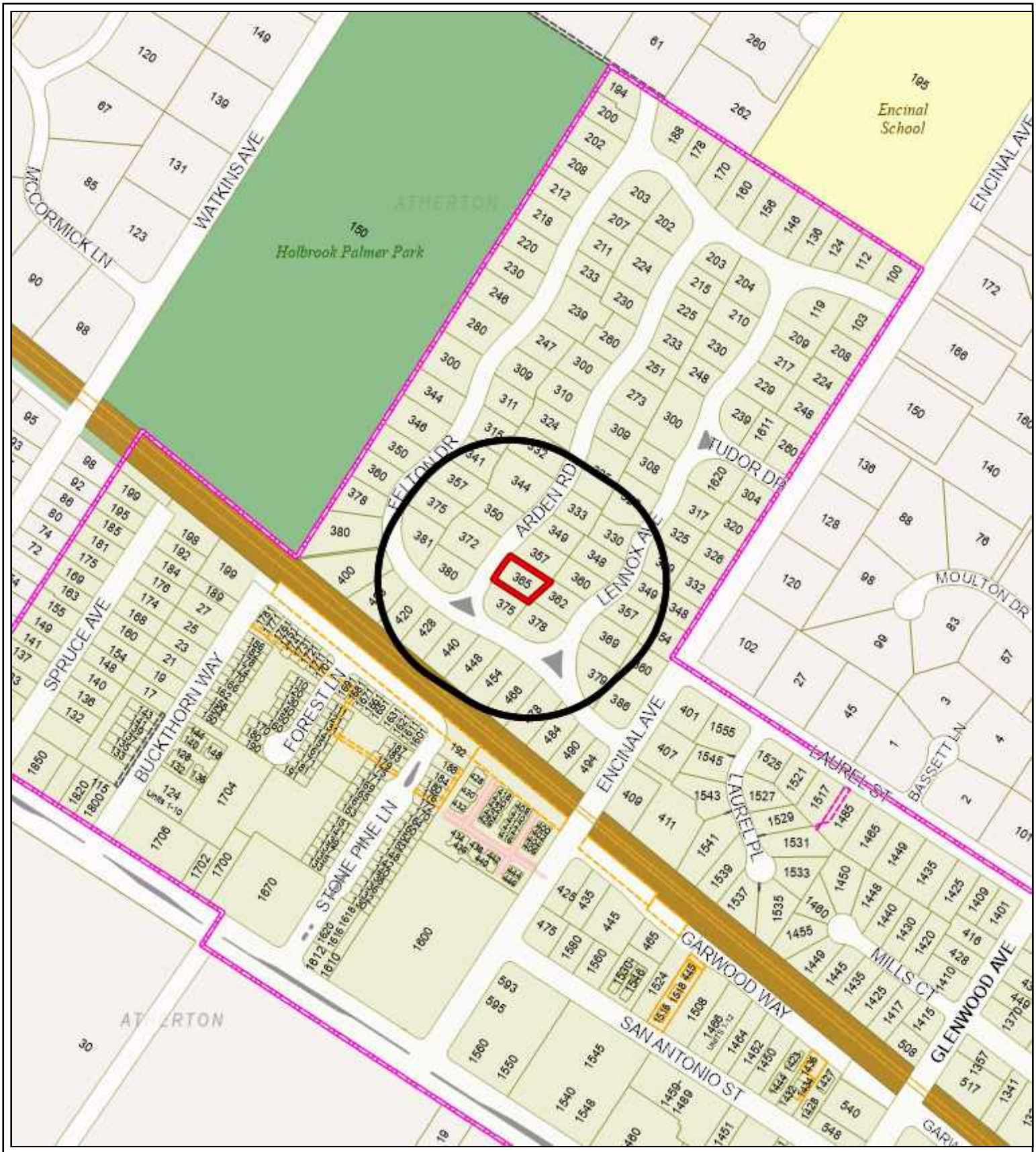
PROJECT CONDITIONS:

action, or proceeding and the City's full cooperation in the applicant's or permittee's defense of said claims, actions, or proceedings.

k. Notice of Fees Protest – The applicant may protest any fees, dedications, reservations, or other exactions imposed by the City as part of the approval or as a condition of approval of this development. Per California Government Code 66020, this 90-day protest period has begun as of the date of the approval of this application.

2. The use permit shall be subject to the following ***project-specific*** conditions:

a. Prior to final building permit inspection of the associated two-story, single-family residence, the applicant shall plant two 24" box Chinese elms subject to review and approval of the City Arborist and the Planning Division.



City of Menlo Park

Location Map
365 Arden Drive

CITY OF MENLO PARK

Scale: 1:4,000 | Drawn By: Matthew Ball | Checked By: Tom Smith | Date: 2/20/2026 | Sheet: 1

ATTACHMENT C

Outlook

Re: New construction at 365 Arden Road

From Bob Rider <bob_riderjr@yahoo.com>
Date Fri 12/19/2025 10:37 AM
To Hannah Chiu <hchiu@tjh.com>
Cc Matthew Ball <mhball@menlopark.gov>

Hi Hannah,

Windows 6 and 7 are unacceptable and you know why. It's not like they provide a scenic view of the ocean or a beautiful landscape. The only view they provide is of my backyard. You don't need those windows. Since this is obviously not a concern of Thomas James let's end this email back and forth and plan to discuss windows 6 and 7 at the Planning Commission public meeting.

Matthew, please include this issue on the meeting agenda.

Thanks,

Bob

On Wednesday, December 17, 2025 at 04:18:05 PM PST, Hannah Chiu <hchiu@tjh.com> wrote:

Hi Bob,

Sorry for the delayed reply, I was out on vacation when I received your email and have been getting caught up on correspondence.

I hear your concern. Although I will not be able to predict traffic, I meant that since these windows are stairwell windows, traffic is typically minimal since people do not often loiter on the landings of their stairwells- making it a low traffic area of homes compared to areas such as kitchens, bedrooms, and living rooms.

We would like to keep the original design of the home and have windows 6 and 7 remain.

Thank you,

Hannah Chiu
Forward Planning Manager, Northern California Division

Thomas James Homes

Scan to Save

C1

275 Shoreline Dr. Suite 400, Redwood City, CA, 94065
Office: (650) 392-3573 | TJH.com

YOuTube Facebook Instagram Linkedin

This email and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they are addressed.

From: Bob Rider <bob_riderjr@yahoo.com>
Sent: Thursday, December 11, 2025 8:52 AM
To: Hannah Chiu <HChiu@tjh.com>
Cc: Matthew Ball <mhball@menlopark.gov>
Subject: Re: New construction at 365 Arden Road

EXTERNAL EMAIL - This email was sent by a person from outside your organization. Exercise caution when clicking links, opening attachments or taking further action, before validating its authenticity.

Secured by Check Point

Hi Hannah,

Thanks for your reply. First of all, windows 6 and 7 are unacceptable. They will allow direct access to our backyard, etc. as mentioned in my email to Matthew below. You have absolutely no way of knowing how much 'traffic' there will be on the stairway. I think there will be plenty given that there are three bedrooms on the second floor including the master. Also, when walking up and down stairs a person is typically facing forward and looking forward/outward, right where windows 6 and 7 will be located. You certainly cannot predict the behavior of the owner and family. Plus, they may sell the house after a year or rent it. Thomas James has no control over that; you will be long gone. In my opinion you don't need windows 6 and 7. Felton Gables is a tight knit community that puts a high value on privacy, and those two windows simply violate that. As do some of the first floor windows (12) and the door (1) with windows.

Thank you for your time and consideration.

Regards,

Bob

C2

On Monday, December 8, 2025 at 04:16:04 PM PST, Hannah Chiu <hchiu@tjh.com> wrote:

Hello Bob,

My name is Hannah Chiu, applicant of 365 Arden Road.

Matthew Ball forwarded me your inquiry below.

Thank you for reaching out. Regarding your concerns about the windows I just wanted to clarify, we are proposing a total of 12 windows. The last window you are counting is a door.

The majority of the windows on the right elevation are on the 1st floor, which will be blocked by the fence that will be placed between our properties.

Also, Windows 4, 5, 6, and 7 are from the stairwell, so there will be minimal traffic in those areas looking outward. Also, windows 4, and 5 are clerestory windows. These windows are set high up on the ceiling near the roofline and are only meant to bring sunlight into the home. There is no platform for anyone to be able to look out of these windows.

I feel that this elevation, window-wise, is actually quite reasonable as there is only one 2nd story window that faces your property. This window is above the tub in the master bathroom, so once again there is minimal traffic in this area and it is set at a 4' sill height.

We don't have any intention to impede on your privacy, but we are proposing a 2nd story home and we need to provide windows on the 2nd story.

Once again, thanks for reaching out regarding your concerns.

C3

Hannah Chiu
Forward Planning Manager, Northern California Division

Thomas James Homes
275 Shoreline Dr. Suite 400, Redwood City, CA, 94065
Office: (650) 392-3573 | TJH.com

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This email and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they are addressed.

From: Bob Rider <bob_riderjr@yahoo.com>
Sent: Monday, November 10, 2025 10:20 AM
To: Matthew Ball <mhball@menlopark.gov>
Subject: New construction at 365 Arden Road

Hi Matthew,

We appreciate the opportunity to voice our strong concerns with the proposed plan to demolish the existing one-story home that is on a substandard lot adjacent to our property at 375 Arden Road. I have carefully reviewed the Thomas James Homes plans for new construction at 365 Arden Road and have some significant concerns. They are proposing 13 windows on the side of their property that directly impacts our home. That is excessive. More importantly, there are two windows on the stairway that are offensive and unacceptable to us. They will completely impinge upon our privacy and peaceful enjoyment of our home. These windows will provide a full view of our backyard and patio (from both the landing and second floor), as well as a direct line of sight into our family room through our French doors that face our backyard. Felton Gables is a very tight knit neighborhood and one that values privacy, community values and a sense of security. We request that the builder remove the windows in the stairway and remove other windows on our side of the property so that we can continue to maintain a sense of privacy.

Thank you for your time and consideration.

Regards,

Bob Rider

375 Arden Road

C5

365 Arden Drive – Attachment C: Data Table

	PROPOSED PROJECT	EXISTING PROJECT	ZONING ORDINANCE
Lot area	9,019.0 sf	9,019.0 sf	10,000.0 sf min
Lot width	75.1 ft	75.1 ft	80.0 ft min
Lot depth	128.5 ft	128.5 ft	100.0 ft min
Setbacks			
Front	20.0 ft	32.3 ft	20.0 ft min
Rear	32.6 ft (main house) 33.7 ft (ADU)	36.4 ft	20.0 ft min
Side (right)	18.1 ft	10.8 ft	10.0 ft min
Side (left)	11.0 ft (main house) 10.0 ft (ADU)	13.4 ft	10.0 ft min
Building coverage	2,205.7 sf 24.5 %	1,650.0 sf 18.3 %	3,156.6 sf max 35.0 % max
FAL (Floor Area Limit)	3,658.2 sf*	1,850 sf	3,203.8 sf max
Square footage by floor	1,630.1 sf/1st 1062.2 sf/2nd 489.0 sf/ADU 477.0 sf/garage 89.7 sf/porch 9.0 sf/fireplace	1,650 sf/1st 200 sf/carport	
Square footage of buildings	3,757 sf	1,850 sf	
Building height	26.3 ft	12.1 ft	28 ft max
Parking	2 covered spaces 1 uncovered ADU space	1 covered space	1 covered space, 1 uncovered space
Note: Areas shown highlighted indicate a nonconforming or substandard situation			

Trees	Heritage trees 6	Non-Heritage trees 5	New trees 2
	Heritage trees proposed for removal 1	Non-Heritage trees proposed for removal 3	Total number of trees 9

*Includes the attached ADU, which is permitted to exceed the FAL.

STAFF REPORT

Planning Commission
Meeting Date: **3/9/2026**
Staff Report Number: **26-004-PC**

Public Hearing: **Consider and adopt a resolution to approve a use permit revision to operate a medical office at an existing commercial office building that is substandard with regard to the minimum parking requirement in the C-1 (Administrative and Professional, Restrictive) zoning district at 333 Middlefield Road, and determine this action is categorically exempt under CEQA Guidelines Section 15301's Class 1 exemption for existing facilities.**

Recommendation

Staff recommends that the Planning Commission adopt a resolution to approve a use permit revision to operate a medical office at an existing commercial office building that is substandard with regard to the minimum parking requirement in the C-1 (Administrative and Professional, Restrictive) zoning district at 333 Middlefield Road, and determine this action is categorically exempt under California Environmental Quality Act (CEQA) Guidelines Section 15301, Class 1 exemption for existing facilities.

The draft resolution, including the recommended actions and conditions of approval, is included as Attachment A.

Policy Issues

Each use permit is considered individually. The Planning Commission should consider whether the required use permit findings identified in Menlo Park Municipal Code (MPMC) Section 16.82.030 (Permits, Granting) can be made for the proposed project. The City's General Plan includes a variety of goals that may be considered in evaluating the proposed project, such as:

- Goal LU-4: Promote and encourage existing and new business to be successful and attract entrepreneurship and emerging technologies for providing goods, services amenities, local job opportunities and tax revenue for the community while avoiding or minimizing potential environmental and traffic impacts.

Background

Site location

The subject property is located in the Linfield Oaks neighborhood at 333 Middlefield Road and is approximately 110,565 square feet (2.54 acres) in size. The site contains an existing approximately 43,559-square-foot, two-story office building and surface parking lot. The C-1-zoned site is at the

southeast corner of Middlefield Road and Survey Lane, adjacent to the former western regional headquarters of the U.S. Geological Survey (USGS) (within the Public Facilities (P-F) zoning district) and across from St. Patrick's Seminary and University (within the Single Family Suburban Residential (R-1-S) zoning district). Other uses in the surrounding neighborhood include a mix of medical and non-medical offices in the C-1 zoning district, and single-family dwellings in the R-1-U (Single Family Urban Residential) and R-3(X) (Apartment District, Conditional Development Permit) zoning districts. A location map is provided in Attachment B.

Previous use permit review

In January 1990, the City Council approved a use permit for a new office building at the site. The building was completed in July 1991. There are no permitted uses in the C-1 zoning district. Professional, executive, and administrative offices are conditional uses, subject to obtaining a use permit. In August 1992, the Planning Commission approved a use permit to allow Merrill Lynch, an investment and wealth management company, to occupy the first level of the building and to allow general office uses, excluding medical and dental offices, to occupy the remainder of the building.

The Planning Commission's 1992 use permit established the ability to locate office uses, excluding medical and dental, in the commercial building. The meeting minutes listed two members of the public who spoke in support of the use permit, and it was approved by a 5-0-2 vote of the Planning Commission (with two abstentions). Although not explicitly discussed, the likely rationale for excluding medical and dental office uses in the building may have been potential traffic generation, as medical and dental offices could have more individuals visiting the site to provide and receive services. This rationale would also be consistent with the 1990 use permit that allowed the construction of the office building, subject to a condition of approval for a transportation demand management (TDM) program for future tenants. Numerous tenants have occupied the building since 1992 and the two-story office building was last occupied in 2025 by a tenant on the second level. The building is presently unoccupied.

Analysis

Proposed use permit revision

Atria Health and Research Institute (Atria) requests a revision to the 1992 use permit to operate a medical office within the existing building. As described on Atria's website, "The Atria Health Institute is a membership-based health care organization delivering care at the forefront of longevity science and precision medicine." Atria proposes to establish their fourth location in Menlo Park (with other locations in New York City, Palm Beach, and Beverly Hills). Atria's proposed medical office would provide non-invasive, non-emergency, outpatient services via private membership. There would be no walk-in services, inpatient beds, or surgical activity. Services would be provided by appointment only with operating hours between 8:00 a.m. and 6:00 p.m., Monday through Friday. Atria's daily staffing range would be 100-125 employees to provide service to approximately 50 patients per day.

Atria intends to occupy the full building. No building exterior or site layout changes are proposed. Internal tenant improvements are anticipated throughout the building to support the proposed medical use (such as exam suites, offices, imaging rooms, and gathering spaces) and would be subject to review and approval through the building permit process. The project plans and project description letter are included

as Attachment A Exhibit A and Attachment A Exhibit B, respectively.

Transportation impact analysis (TIA)

The City has established transportation impact analysis (TIA) guidelines, and projects generating 100 or more vehicle trips a day are generally required to complete a TIA. Because the proposed project would generate 100 or more vehicle trips a day based on the project description and data provided by the applicant, a TIA was prepared by W-Trans, an Oakland-based traffic engineering consulting firm, for the proposed medical office use. The report discusses level of service (LOS) analysis and an exemption from vehicle miles travelled (VMT) analysis, per the City's guidelines. The TIA is included as Attachment A Exhibit C.

Parking

The existing office building is surrounded by a surface parking lot with 161 spaces, inclusive of marked electric vehicle (EV) and carpool parking spaces. In accordance with MPMC Chapter 16.72, nonresidential uses in the C-1 zoning district are required to provide one parking space per 200 square feet of gross floor area. In consideration of this parking ratio, 218 spaces are required for the proposed use, which is 57 more spaces than provided. Although the number of existing parking spaces is substandard per zoning requirements, staff believes the proposed medical office would have sufficient parking as it is unlikely every employee and patient (125 employees and 50 patients daily, for a maximum of 175 individuals) would arrive and utilize the existing 161 parking spaces at the same time, especially with consideration to Atria's appointment-only service model. Additionally, the TIA also reviewed and compared industry standard parking generation rates from the Institute for Transportation Engineers (ITE) for a standard medical office building, and the projected parking supply is expected to be adequate to accommodate demand. ITE uses parking data from various locations to establish average rates that can be used to estimate parking demand for developments with similar land uses.

Level of service (LOS)

The City's guidelines require that the TIA analyze LOS for local planning purposes in conformance with the City's General Plan. The study intersections were selected based on the TIA Guidelines. The LOS analysis determines whether the project traffic would cause an intersection LOS to be potentially noncompliant with local policy if it degrades the LOS operational level or increases delay under near term and/or cumulative conditions. The LOS and delay thresholds vary depending on the street classifications as well as whether the intersection is on a State route or not. The following thresholds are excerpted from the City's TIA Guidelines:

- A project is considered potentially noncompliant with local policies if the addition of project traffic causes an intersection on a collector street operating at LOS "A" through "C" to operate at an unacceptable level (LOS "D," "E" or "F") or have an increase of 23 seconds or greater in average vehicle delay, whichever threshold is exceeded first. Potential noncompliance shall also include a project that causes an intersection on arterial streets or local approaches to State controlled signalized intersections operating at LOS "A" through "D" to operate at an unacceptable level (LOS "E" or "F") or have an increase of 23 seconds or greater in average vehicle delay, whichever comes first.
- A project is also considered potentially noncompliant if the addition of project traffic causes an increase of more than 0.8 seconds of average delay to vehicles on all critical movements for intersections operating at a near-term LOS "D" through "F" for collector streets and at a near-term LOS "E" or "F" for arterial streets. For local approaches to State controlled signalized intersections, a project is considered to be potentially noncompliant if the addition of project traffic causes an increase of more than 0.8

seconds of delay to vehicles on the most critical movements for intersections operating at a near-term LOS "E" or "F."

Where deficiencies are identified, the TIA guidelines require consideration of improvement measures. Any such improvement measures could be imposed on the project as conditions of approval to ensure the general health, safety and welfare of the community, provided the measures do not induce VMT.

The proposed project was evaluated for intersection LOS changes caused by the project as part of the TIA. The TIA concluded that the project would have limited effects to the 16 studied intersections and would not result in any LOS changes from acceptable to unacceptable levels of service, as shown in Table 1 below. In addition, intersections that change a level of service do not exceed the thresholds of the 23 seconds or 0.8 average critical delay, aside from one intersection at Ravenswood Avenue and Laurel Street. However, this deficiency would be alleviated through retiming the traffic signal to adjust to changing traffic patterns associated with near-term pending, approved, and under construction projects. Traffic signals are routinely retimed, and this would not be considered a deficiency specific to the proposed project. Therefore, no roadway improvement measures specific to this project are deemed necessary.

Table 1: Intersection level of service

Intersection	Existing LOS (AM/PM)	Near-term (AM/PM)	Near-term plus project (AM/PM)
Marsh Road and U.S. 101 N Off-Ramp	B/B	C/C	C/C
Marsh Road and U.S. 101 S Off-Ramp	C/C	D/C	D/C
Marsh Road and Scott Drive	B/B	B/C	B/C
Marsh Road and Florence Street-Bohannon Drive	C/C	C/C	C/C
Marsh Road and Bay Road	B/C	B/C	B/C
Ravenswood Avenue and Laurel Street	D/E	D/E	D/E
Ravenswood Avenue and El Camino Real	D/C	D/D	D/D
Ravenswood Avenue and Middlefield Road	C/C	C/C	D/C
Ringwood Avenue and Middlefield Road	C/C	C/C	C/C
Willow Road and Middlefield Road	D/D	E/E	E/E
Willow Road and Gilbert Avenue	A/B	B/B	B/B
Willow Road and Coleman Avenue	A/B	A/B	A/B
Willow Road and Durham Street-VA Hospital	C/B	D/B	D/B
Willow Road and Bay Road	C/B	E/B	E/B

Willow Road and U.S. 101 S Ramps	E/B	F/E	F/E
Willow Road and U.S. 101 N Ramps	C/C	D/F	D/F

Vehicle miles travelled (VMT)

The City's TIA guidelines require that the TIA analyze VMT. VMT is a measurement of the amount and distance that a resident, employee, or visitor drives in a specific area during a specified period of time.

The Transportation Division reviewed the proposed project to analyze its potential VMT. While the TIA guidelines do not have a specific threshold for medical office uses, medical office uses are generally considered to operate similar to local-serving retail (such as a grocery store or convenience store). Like local-serving retail, medical offices primarily serve patients in the surrounding community, as patients typically select a medical facility based on proximity to their home or workplace, therefore reducing overall trip lengths and travel times.

Based on the TIA guidelines, local-serving retail projects of 50,000 square feet or less are exempt from VMT analysis and assumed to not increase total VMT; therefore, per the TIA guidelines, the project is exempt from a VMT analysis.

Transportation impact fee

In accordance with MPMC Chapter 13.26, the City has an adopted transportation impact fee (TIF) program to determine the shared cost of infrastructure necessary as a result of new development, including changes of use. The purpose of this fee is to help provide adequate transportation improvements to serve cumulative development within the city. The TIF applicable to the proposed conversion of the general office building to medical office building is based on the current rates for medical office land uses ($65.94 per square foot) compared to general office land uses ($21.91 per square foot) multiplied by the total building square footage proposed to be occupied by Atria (43,559 square feet). The TIF for the proposed project equates to $1,917,903 and is ensured to be completed as draft condition 2b.

Transportation demand management plan

The proposed medical office would generate at least 100 average daily trips and is therefore required by the City/County Association of Governments of San Mateo County (C/CAG) to implement a transportation demand management plan (TDM plan) to reduce vehicular trips by a specified percentage. For the proposed medical office, a TDM plan to reduce the number of trips by 35% is required by C/CAG. The applicant has submitted a TDM plan that details the project's strategy to comply with TDM requirements (Attachment C). The applicant would implement measures such as enrolling and actively participating in Commute.org (transportation management association), having a designated TDM coordinator, providing preferential parking for carpools, and providing transit or ridesharing passes/subsidies. When implemented, the TDM plan is anticipated to result in a trip reduction of 35%, which is consistent with C/CAG TDM requirements for the size and type of project. The project would be subject to annual monitoring through C/CAG and/or its designee Commute.org, with City support as necessary, to demonstrate that the project has implemented the appropriate TDM measures and that the measures are working to adequately reduce daily trips; this is ensured to be completed as draft condition 2c.

Community outreach and correspondence

The applicant indicated that they conducted outreach to neighboring property owners as well as other interested parties. As of the preparation of this staff report, no correspondence regarding the proposed project has been received by staff.

Conclusion

The existing two-story office building was completed in 1991 and over the last three decades has been occupied by various general office uses. The proposed project would allow a medical office use in an existing, unoccupied office building. The conditions of approval would regulate future uses/tenants by requiring consistency with the maximum number of employees and patients outlined in the project description letter. This would help to avoid unanticipated increases in employees or patients visiting the site, and/or parking or circulation impacts to the site or surrounding areas, without further discretionary review. A TIA was prepared for the proposal and concluded that the project would not contribute to the need to construct any roadway improvements that are specific to the project. The proposed project includes a TDM plan that is anticipated to result in a trip reduction of 35%, which is consistent with C/CAG TDM requirements for the size and type of project. A TIF would be collected and used to fund transportation improvements throughout the city for all modes of travel. Staff recommends that the Planning Commission adopt a resolution (Attachment A) approving the use permit revision to allow a medical office use at an existing commercial office building that is substandard with regard to the minimum parking requirement, subject to the project-specific conditions of approval in Attachment A Exhibit D.

Impact on City Resources

The project sponsor is required to pay Planning, Building, and Public Works permit fees, based on the City's Master Fee Schedule, to fully cover the cost of staff time spent on the review and processing of the project. Prior to building permit issuance, the project sponsor must complete the TIF payment.

Environmental Review

The proposed project would allow a medical office use in an existing, unoccupied office building. No building exterior or site layout changes are proposed. Interior tenant improvements are anticipated throughout the building to support the proposed medical use and would be subject to review and approval through the building permit process. The proposed project involves negligible expansion of use and as conditioned, is categorically exempt under Section 15301, Class 1 ("Existing Facilities") of the current CEQA Guidelines.

Public Notice

Public notification was achieved by posting the agenda, with the agenda items being listed, at least 72 hours prior to the meeting. Public notification also consisted of publishing a notice in the local newspaper and notification by mail of owners and occupants within a 300-foot radius of the subject property.

Appeal Period

Planning Commission action will be effective after 15 days unless the action is appealed to the City Council, in which case the outcome of the application shall be determined by the City Council.

Attachments

A. Draft Planning Commission resolution
   Exhibits to Attachment A
   A. Project plans
   B. Project description letter
   C. Transportation impact analysis
   D. Conditions of approval
B. Location map
C. Transportation demand management plan

Report prepared by:
Calvin Chan, Senior Planner

Report reviewed by:
Tom Smith, Principal Planner
Joanna Chan, Transportation Manager

PLANNING COMMISSION RESOLUTION NO. 2026-0XX

A RESOLUTION OF THE PLANNING COMMISSION OF THE CITY OF MENLO PARK APPROVING A USE PERMIT REVISION TO OPERATE A MEDICAL OFFICE AT AN EXISTING COMMERCIAL OFFICE BUILDING THAT IS SUBSTANDARD WITH REGARD TO THE MINIMUM PARKING REQUIREMENT IN THE C-1 (ADMINISTRATIVE AND PROFESSIONAL, RESTRICTIVE) ZONING DISTRICT AT 333 MIDDLEFIELD ROAD.

WHEREAS, the City of Menlo Park ("City") received an application requesting a use permit revision to operate a medical office at an existing commercial office building that is substandard with regard to the minimum parking requirement in the C-1 (Administrative and Professional, Restrictive) zoning district (collectively, the "Project") from Atria Health and Research Institute ("Atria") ("Applicant") on behalf of the Bohannon Development Company ("Owner") at 333 Middlefield Road (APN 062-421-040) ("Property"). The Project use permit revision is depicted in and subject to the development plans and project description letter, which are attached hereto as Exhibit A and Exhibit B, respectively, and incorporated herein by this reference; and

WHEREAS, the Property is located in the Administrative and Professional, Restrictive (C-1) zoning district where there are no principally permitted uses; and

WHEREAS, in January 1990, the City Council approved a use permit for a new office building at the site and the building was completed in July 1991; and

WHEREAS, in August 1992, the Planning Commission approved a use permit for office uses, excluding medical and dental uses, in the commercial building; and

WHEREAS, numerous tenants have occupied the building since 1992 and the building is presently unoccupied; and

WHEREAS, the Applicant requests a revision to the 1992 use permit to operate a medical office within the existing building and no building exterior or site layout changes are proposed; and

WHEREAS, the Applicant intends to occupy the full building, and interior tenant improvements are anticipated throughout the building to support the proposed medical use and would be subject to review and approval through the building permit application process; and

WHEREAS, the Project would comply with all objective standards of the C-1 zoning district, apart from the required minimum parking for the site; and

WHEREAS, the site includes 161 existing parking spaces and is substandard with regard to parking per Menlo Park Municipal Code Chapter 16.72, and a change of use on a property with substandard parking requires a use permit; and

WHEREAS, although the Project would continue to have substandard parking for the site, the proposed medical office will have sufficient parking opportunity as it is unlikely every employee or patient would arrive and utilize the parking spaces at the same time, especially with consideration to the appointment-only service model Applicant uses; and

WHEREAS, a transportation impact analysis (TIA) was prepared per City guidelines, attached hereto and incorporated herein by this reference as Exhibit C, and the TIA concluded that the Project would have limited effects to the studied intersections and would not result in any level of service (LOS) changes from acceptable to unacceptable, and therefore, no roadway improvement measures are deemed necessary; and

WHEREAS, the TIA also reviewed and compared Institute for Transportation Engineers' (ITE) industry standard parking generation rates for a medical office building, and the projected parking supply is expected to be adequate to accommodate demand; and

WHEREAS, per the TIA guidelines, local-serving retail projects of 50,000 square feet or less are exempt from vehicle miles travelled (VMT) analysis and assumed to not increase total VMT; and

WHEREAS, medical office uses are generally considered to operate similar to local-serving retail in that they primarily serve patients in the surrounding community as patients typically select a medical facility based on proximity to their home or workplace; and the Project is therefore exempt from VTM analysis; and

WHEREAS, the required transportation impact fee (TIF) of $1,917,903 will be used to fund transportation improvements throughout the city for all modes of travel; and

WHEREAS, the Project includes a transportation demand management (TDM) plan that is anticipated to result in a trip reduction of 35%, which is consistent with TDM requirements for the size and type of project from the City/County Association of Governments of San Mateo County (C/CAG). The Project would be subject to annual monitoring to demonstrate that the project has implemented the appropriate TDM measures and that the measures are working to adequately reduce daily trips; and

WHEREAS, the Project, requires discretionary actions by the City as summarized above, and therefore the California Environmental Quality Act ("CEQA," Public Resources Code Section §21000 et seq.) and CEQA Guidelines (Cal. Code of Regulations, Title 14, §15000 et seq.) require analysis and a determination regarding the Project's environmental impacts; and

WHEREAS, the City is the lead agency, as defined by CEQA and the CEQA Guidelines, and is therefore responsible for the preparation, consideration, certification, and approval of environmental documents for the Project; and

WHEREAS, the Project involves negligible expansion of use and as conditioned is exempt from environmental review pursuant to CEQA Guidelines section 15301, Class 1 ("Existing Facilities"); and

WHEREAS, all required public notices and public hearings were duly given and held according to law; and

WHEREAS, at a duly and properly noticed public hearing held on March 9, 2026, the Planning Commission fully reviewed, considered, and evaluated the whole of the record including all public and written comments, pertinent information, documents and plans, prior to taking action regarding the Project.

NOW, THEREFORE, THE MENLO PARK PLANNING COMMISSION HEREBY RESOLVES AS FOLLOWS:

Section 1. Recitals. The Planning Commission has considered the full record before it, which may include but is not limited to such things as the staff report, public testimony, and other materials and evidence submitted or provided, and the Planning Commission finds the foregoing recitals are true and correct, and they are hereby incorporated by reference into this Resolution.

Section 2. Conditional Use Permit Findings. The Planning Commission of the City of Menlo Park does hereby make the following Findings:

The approval of a use permit revision to operate a medical office at an existing commercial office building that is substandard with regard to the minimum parking requirement in the C-1 (Administrative and Professional, Restrictive) zoning district at 333 Middlefield Road is granted based on the following findings, which are made pursuant to Menlo Park Municipal Code Section 16.82.030:

1. That the establishment, maintenance, or operation of the use applied for will, under the circumstance of the particular case, not be detrimental to the health, safety, morals, comfort and general welfare of the persons residing in the neighborhood of such proposed use, or injurious or detrimental to property and improvements in the neighborhood or the general welfare of the city because:

    a. Consideration and due regard were given to the nature and condition of all adjacent uses and structures, and to general plans for the area in question and surrounding areas, and impact of the application hereon. The Project involves no building exterior or site improvements and is designed in a manner which is consistent with the goals, policies, and objectives of the General Plan and applicable Municipal Code and Zoning

Ordinance requirements (except for off-street parking requirements), and more specifically, the Project would be compatible with the surrounding uses and includes project-specific conditions to clarify the land use entitlement.

b. The Project would remain substandard with regard to the parking requirements for the C-1 zoning district. However, the proposed medical office will have sufficient parking as not every employee or patient would arrive and utilize the parking spaces at the same time, especially with consideration to the appointment-only service model Atria operates by. Additionally, conditions of approval, attached hereto and incorporated herein by this reference as Exhibit D, are included to clarify the land use entitlement and regulate future uses/tenants to minimize potential parking and/or circulation impacts to the site or surrounding area; and

c. The Project is designed to meet all the applicable codes and ordinances of the City of Menlo Park Municipal Code, and the Planning Commission concludes that the Project would not be detrimental to the health, safety, and welfare of the surrounding community as the proposed medical office would be housed in an existing office building with surrounding surface parking lot that has been in place since 1991.

Section 3. Conditional Use Permit. The Planning Commission approves Use Permit No. PLN2025-00040, which use is depicted in and subject to the development plans and project description letter, which are attached hereto and incorporated herein by this reference as Exhibit A and Exhibit B, respectively. The use permit is conditioned in conformance with the conditions attached hereto and incorporated herein by this reference as Exhibit D.

Section 4. ENVIRONMENTAL REVIEW. The Planning Commission makes the following findings, based on its independent judgment after considering the Project, and having reviewed and taken into consideration all written and oral information submitted in this matter:

1. The Project is categorically exempt from environmental review pursuant to Cal. Code of Regulations, Title 14, §15301 et seq. (Existing Facilities).

Section 5. SEVERABILITY

If any term, provision, or portion of these findings or the application of these findings to a particular situation is held by a court to be invalid, void or unenforceable, the remaining provisions of these findings, or their application to other actions related to the Project, shall continue in full force and effect unless amended or modified by the City.

I, Corinna Sandmeier, Principal Planner of the City of Menlo Park, do hereby certify that the above and foregoing Planning Commission Resolution was duly and regularly passed

and adopted at a meeting by said Planning Commission on March 9, 2026, by the following votes:

AYES:

NOES:

ABSENT:

ABSTAIN:

RECUSED:

IN WITNESS THEREOF, I have hereunto set my hand and affixed the Official Seal of said City on this ____ day of March 2026.

PC Liaison Signature

_____
Corinna Sandmeier
Principal Planner
City of Menlo Park

Exhibits

A. Project plans
B. Project description letter
C. Transportation impact analysis
D. Conditions of approval

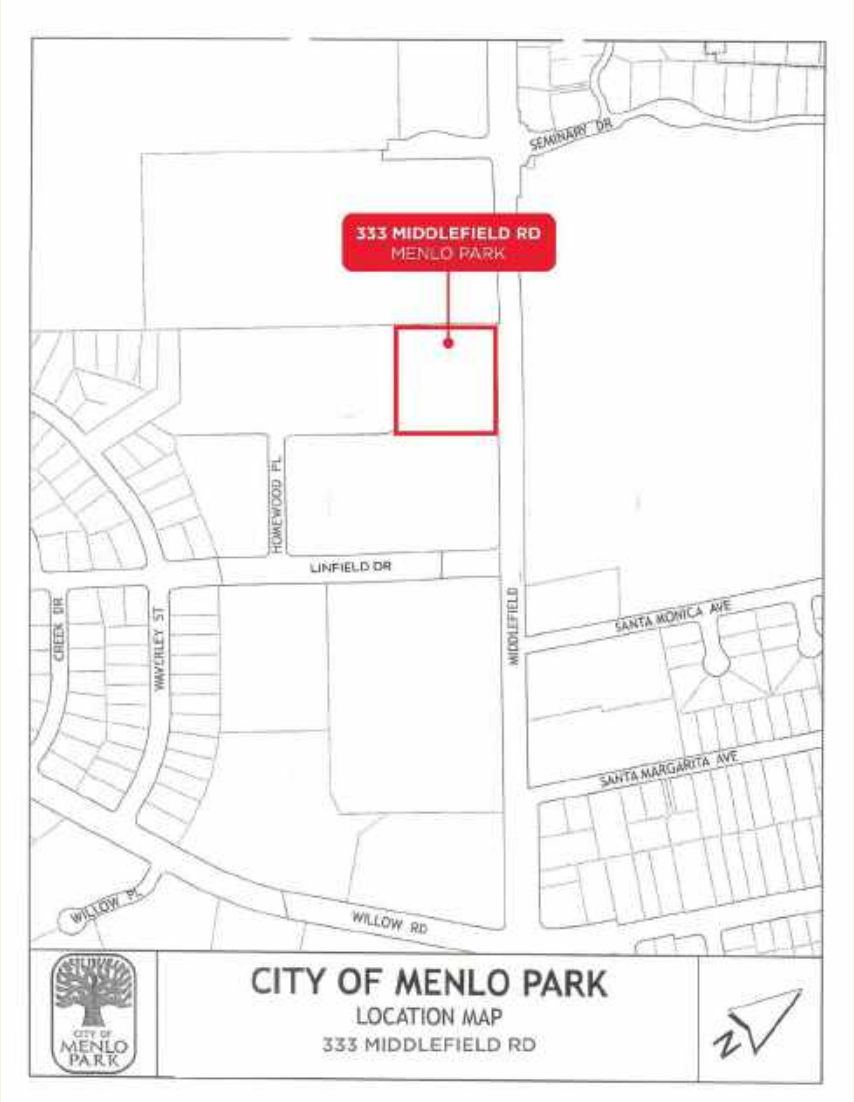
* Any frontage improvements which are damaged as a result of construction will be required to be replaced. All frontage improvement work shall be in accordance with the latest version of the City Standard Details.

**An encroachment permit from the Engineering Division is required prior to any construction activities, including utility laterals, in the public right of way.

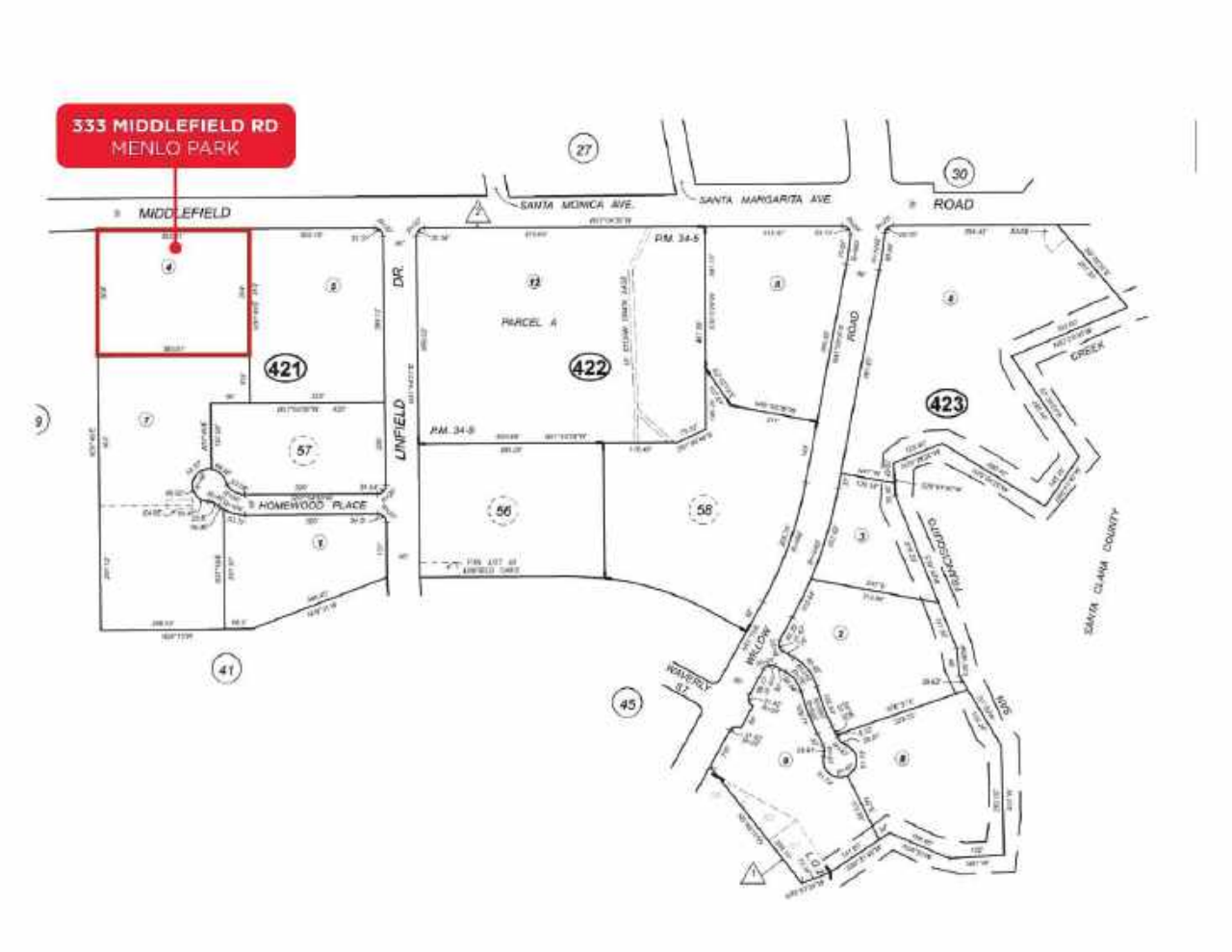
ATRIA MENLO PARK

Project Plans
2.27.26

Area Plan


333 MIDDLEFIELD RD
MENLO PARK
SEMINARY DR
HOMEWOOD PL
LINFIELD DR
MIDDLEFIELD
SANTA MONICA AVE
SANTA MARGARITA AVE
CREEK DR
WAVERLEY ST
WILLOW PL
WILLOW RD
CITY OF MENLO PARK
LOCATION MAP
333 MIDDLEFIELD RD
N

Area Plan



333 MIDDLEFIELD RD
MENLO PARK
MIDDLEFIELD
SANTA MONICA AVE.
SANTA MARGARITA AVE.
ROAD
LINFIELD DR.
PARCEL A
HOMEWOOD PLACE
421
422
423
27
30
57
56
58
41
45
SANTA CLARA COUNTY

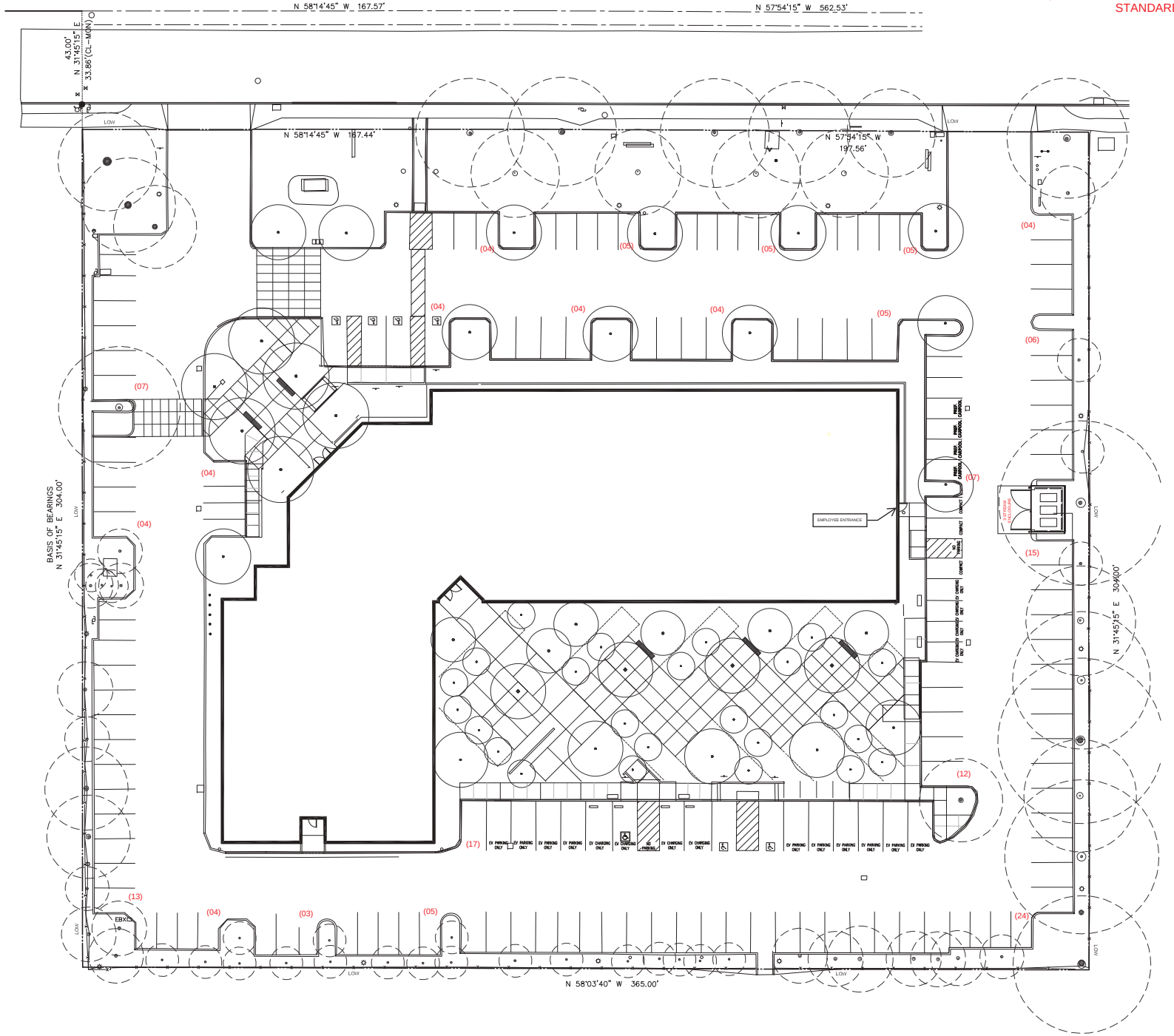
Area Plan


250 MIDDLEFIELD RD
USGC
200 MIDDLEFIELD RD
321 MIDDLEFIELD RD
100 MIDDLEFIELD RD
525 MIDDLEFIELD RD
333 MIDDLEFIELD RD
275 MIDDLEFIELD RD
345 MIDDLEFIELD RD
Daycare
85 MIDDLEFIELD RD
OFFICE
MEDICAL OFFICE
8 HOMEWOOD PL
90 MIDDLEFIELD RD

Parking - Existing Plan

EXISTING PARKING SUMMARY

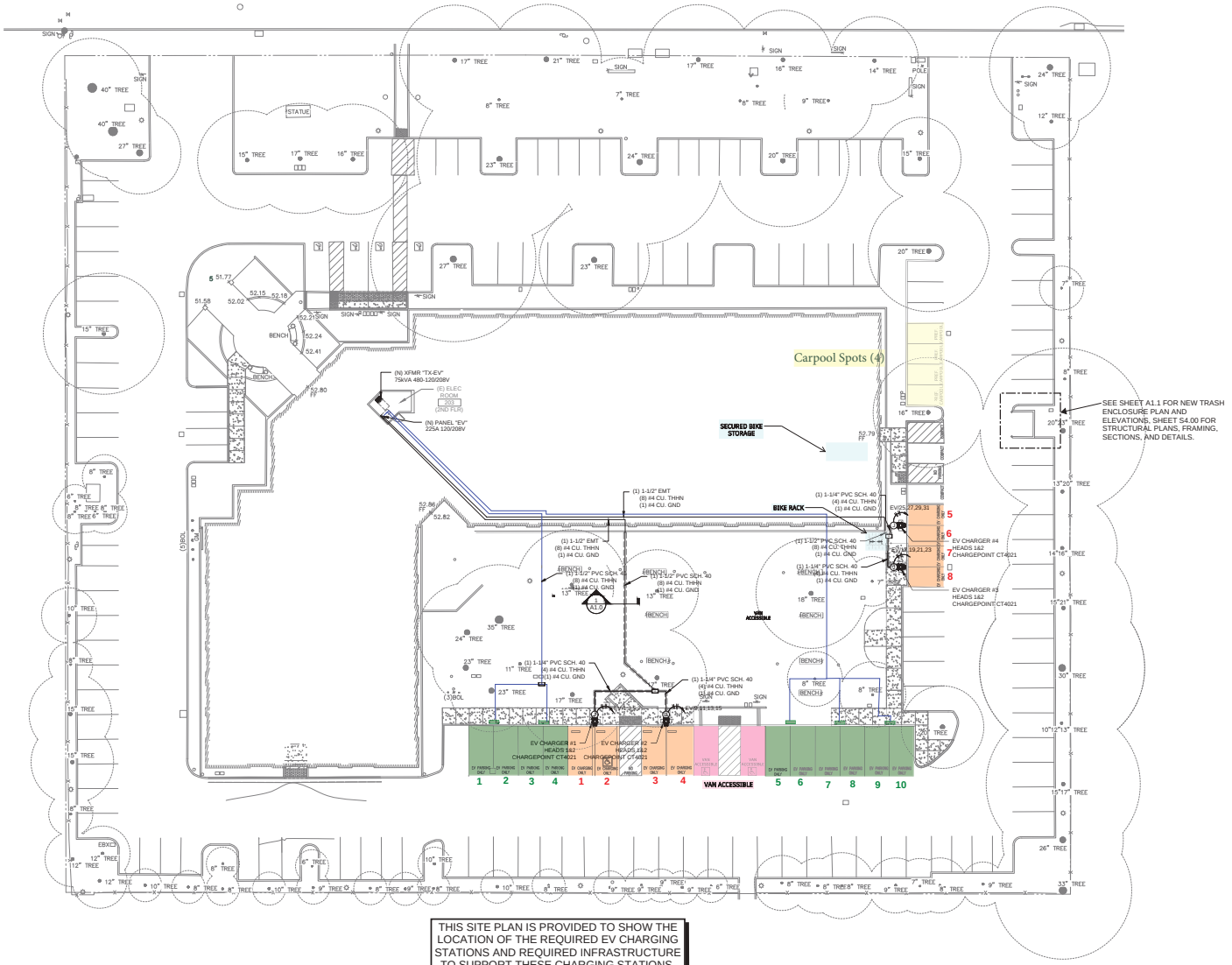
ACCESSIBLE & VAN STALLS (1 OF 6)	06
EV CHARGING STALLS & VAN ACCESSIBLE CHARGING STALL (1 OF 8)	08
EV PARKING STALLS (PREWIRED FOR FUTURE EV CHARGING)	10
STANDARD PARKING STALLS	137
TOTAL	161



A10

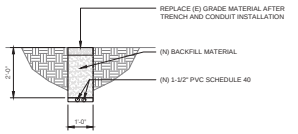
JULY 01, 2025
SCALE: NTS

Parking - Revised Plan



THIS SITE PLAN IS PROVIDED TO SHOW THE LOCATION OF THE REQUIRED EV CHARGING STATIONS AND REQUIRED INFRASTRUCTURE TO SUPPORT THESE CHARGING STATIONS.

ELECTRICAL SITE PLAN
SCALE: 1/16" = 1' - 0"



1 TYPICAL TRENCH DETAIL
SCALE: N.T.S.

ELECTRICAL LEGEND

- (N) FLUSH MOUNTED JUNCTION BOX
- (N) N9 CHRISTY BOX
- (N) EV CHARGING STATION, DUAL HEAD, CHARGEPOINT CT4021
- 8 EV PARKING SPACES EQUIPPED WITH CHARGING STATIONS BY CHARGEPOINT
- 10 EV PARKING SPACES

Revised: DES 08/30/21

SHEET NOTES

1. SEE SHEET ES.1 FOR EV CHARGER DETAILS.
2. PER CEC 625.43, EQUIPMENT RATED MORE THAN 60 AMPS OR 150 VOLTS TO GROUND, DISCONNECTING MEANS SHALL BE PROVIDED AND INSTALLED AT A READILY ACCESSIBLE LOCATION AND SHALL BE LOCKABLE OPEN PER CEC 110.25. THIS REQUIREMENT SHALL BE MET IN THE EVENT THAT THE CHARGER MANUFACTURER OR MODEL CHANGES DURING CONSTRUCTION OR FOR OTHER REASONS. △

DES ARCHITECTS ENGINEERS
399 Bradford Street Redwood City, Ca. 94063
Tel: (650) 364-6453
Fax: (650) 364-2618
www.des-ae.com

RK ELECTRIC
Full-Service Electrical and Data Contractor
42021 Osgood Road Fremont, CA 94539
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Cont. License # 471290

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BOHANNON DEVELOPMENT CO.
Sixty 31st Avenue
San Mateo, CA 94403

BOHANNON

333 Middlefield Road
SITE & INTERIOR CORE UPGRADE PROJECT
333 Middlefield Road
Menlo Park, CA 94025

EV CHARGING INFRASTRUCTURE SITE PLAN

ISSUE:	DATE:	DESCRIPTION:
	02.19.19	ISSUED FOR PERMIT
1	12.18.20	REVISION 1
2	05.25.21	REVISION 2
3	07.28.21	PLAN CHECK RESPONSE 5
4	03/04/22	PC RESPONSE #1
	03.11.22	RESPONSE TO PW COMMENTS

DRAWN BY: TF
REVIEWED BY: TF
APPROVED BY: TW
DES PROJECT NO.: 4151.002

LICENSED ARCHITECT KEITH D. NORMAN No. C-27884 9/30/21 STATE OF CALIFORNIA

© 2018

333 BLDG. A1.0 SHEET NO.
APPROVED PLANS ELECTRONIC COPY

Site Photos (interiors)


1


2


3


4


5


6

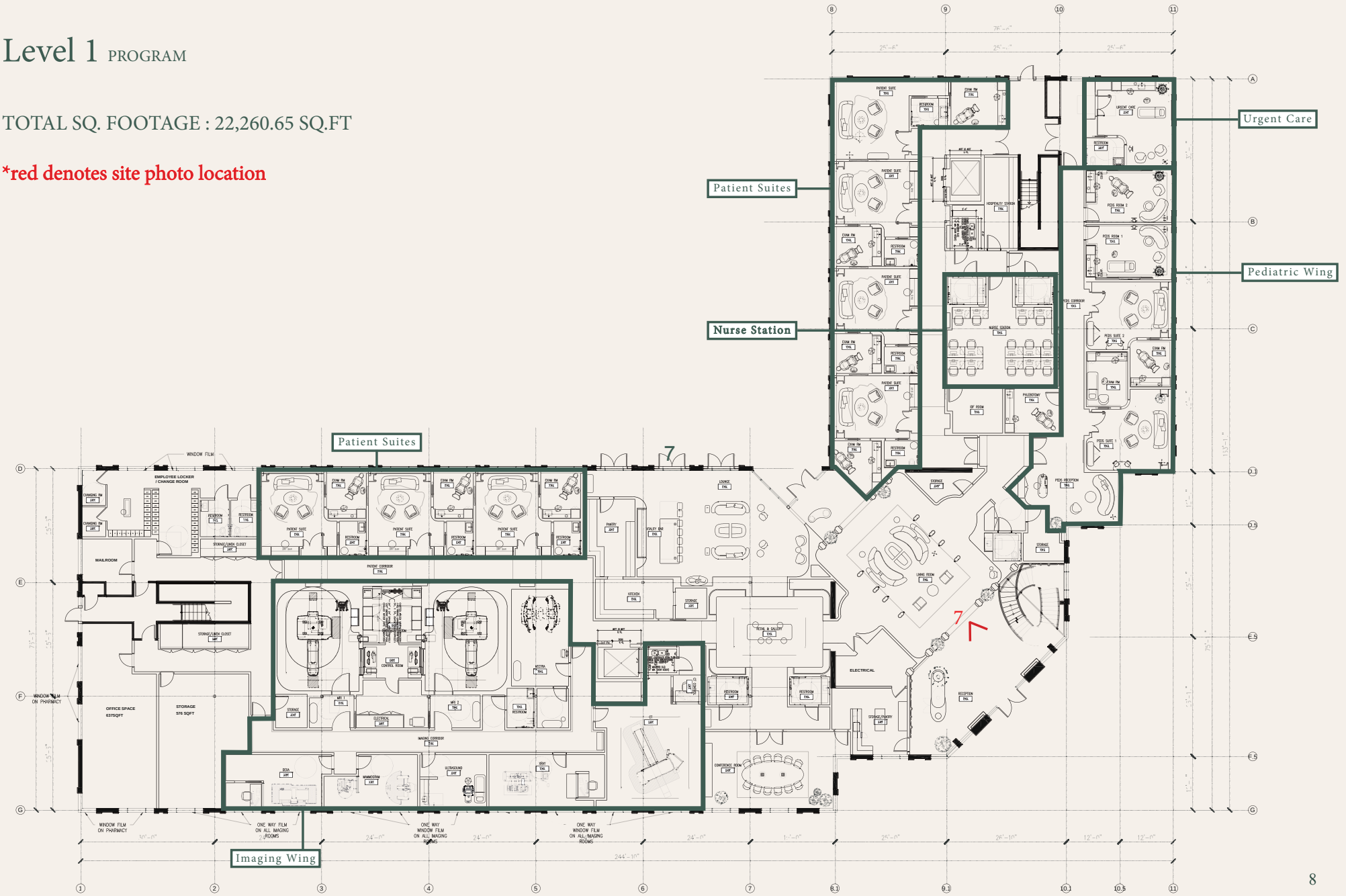

7


8

Level 1 PROGRAM

TOTAL SQ. FOOTAGE : 22,260.65 SQ.FT

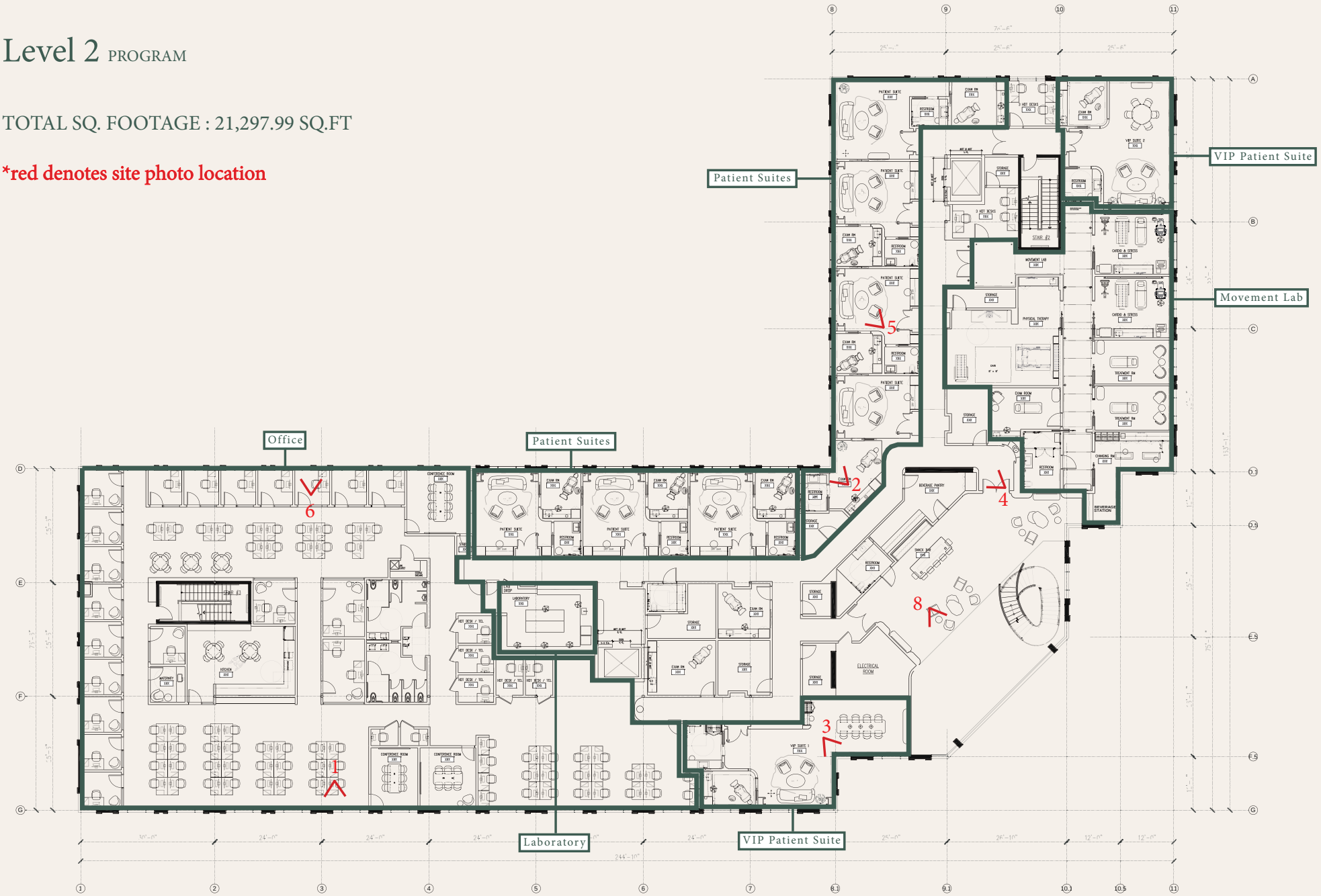
*red denotes site photo location



Level 2 PROGRAM

TOTAL SQ. FOOTAGE : 21,297.99 SQ.FT

*red denotes site photo location

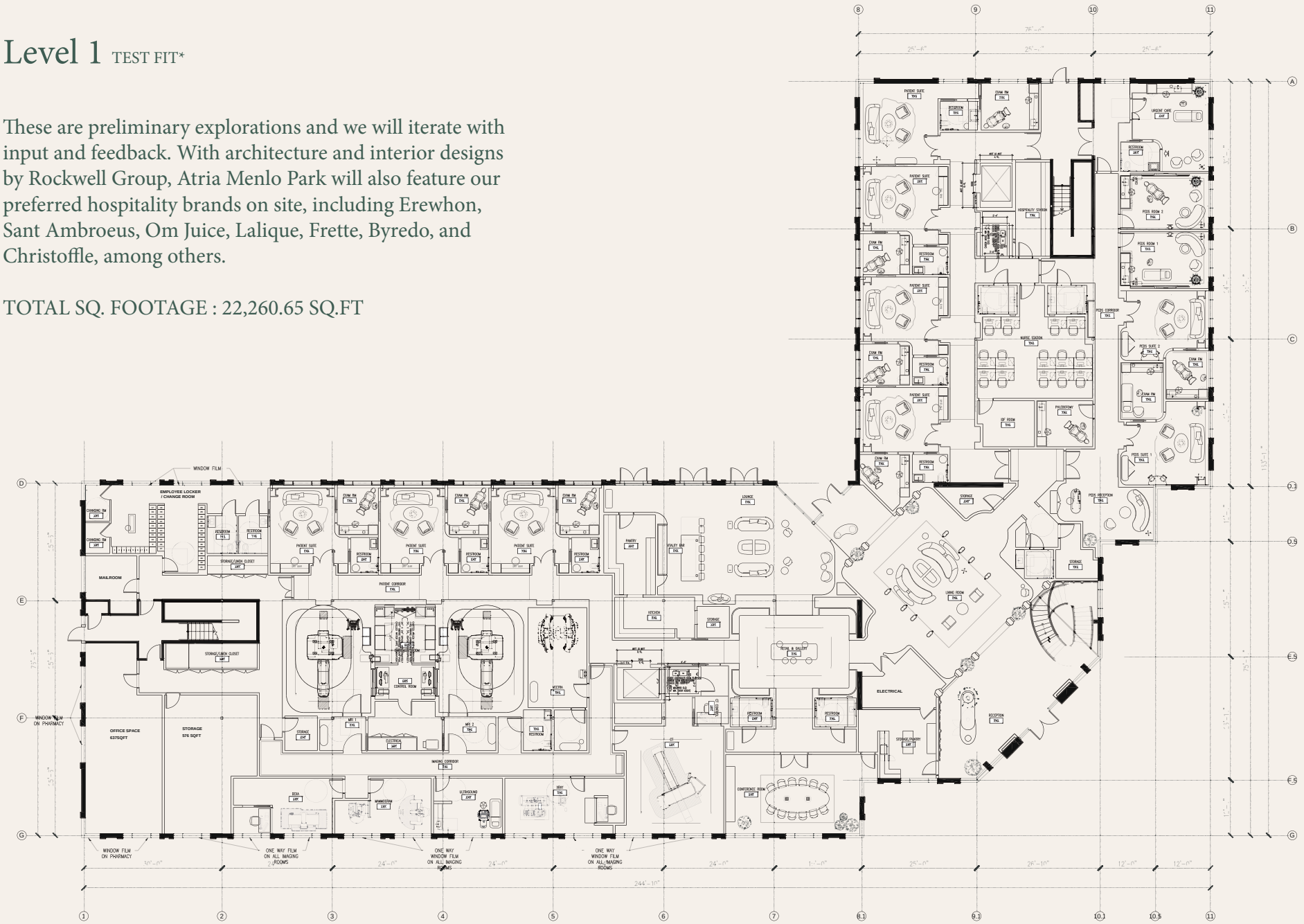


A14

Level 1 TEST FIT*

These are preliminary explorations and we will iterate with input and feedback. With architecture and interior designs by Rockwell Group, Atria Menlo Park will also feature our preferred hospitality brands on site, including Erewhon, Sant Ambroeus, Om Juice, Lalique, Frette, Byredo, and Christoffle, among others.

TOTAL SQ. FOOTAGE : 22,260.65 SQ.FT



Level 2 TEST FIT*

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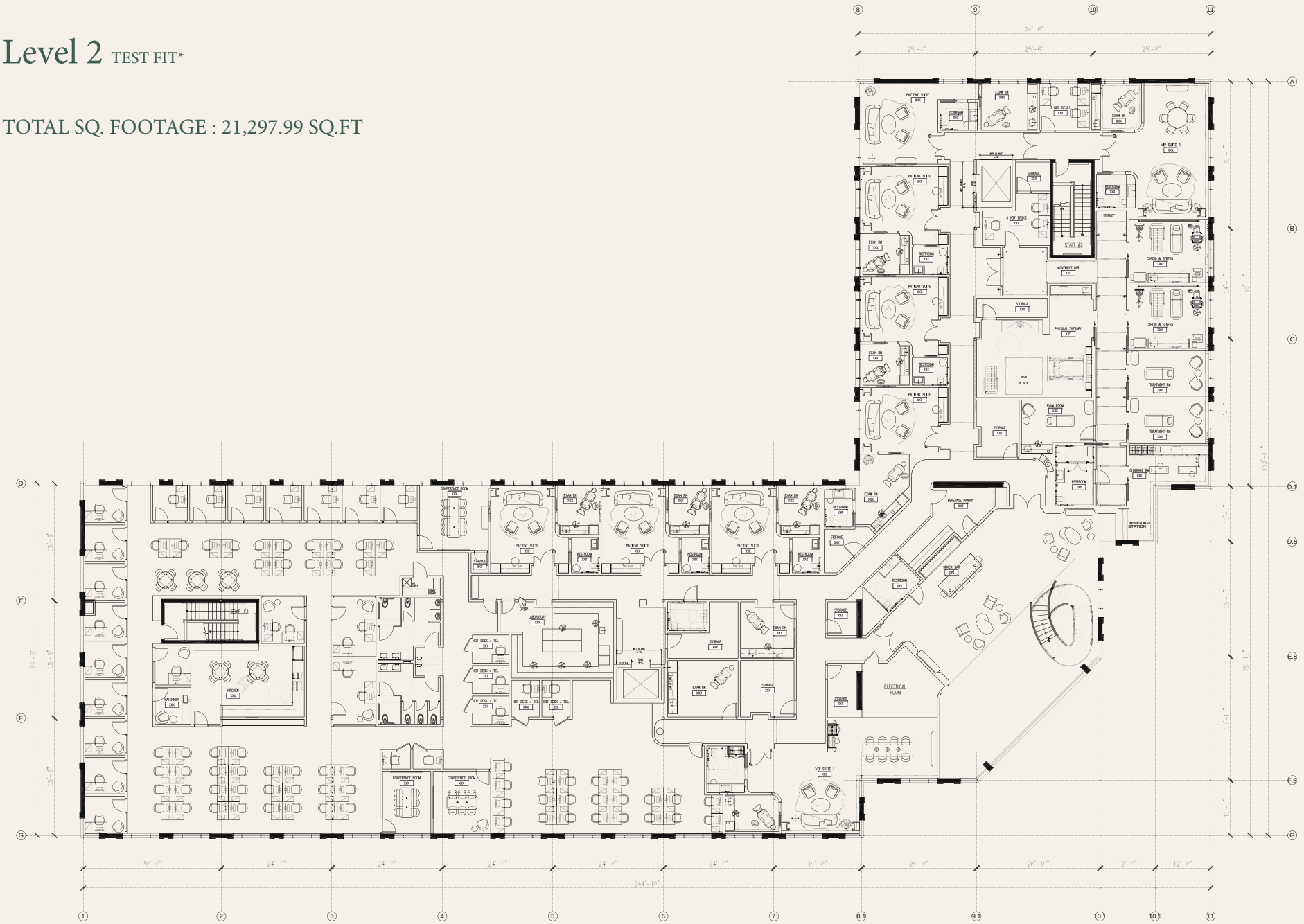
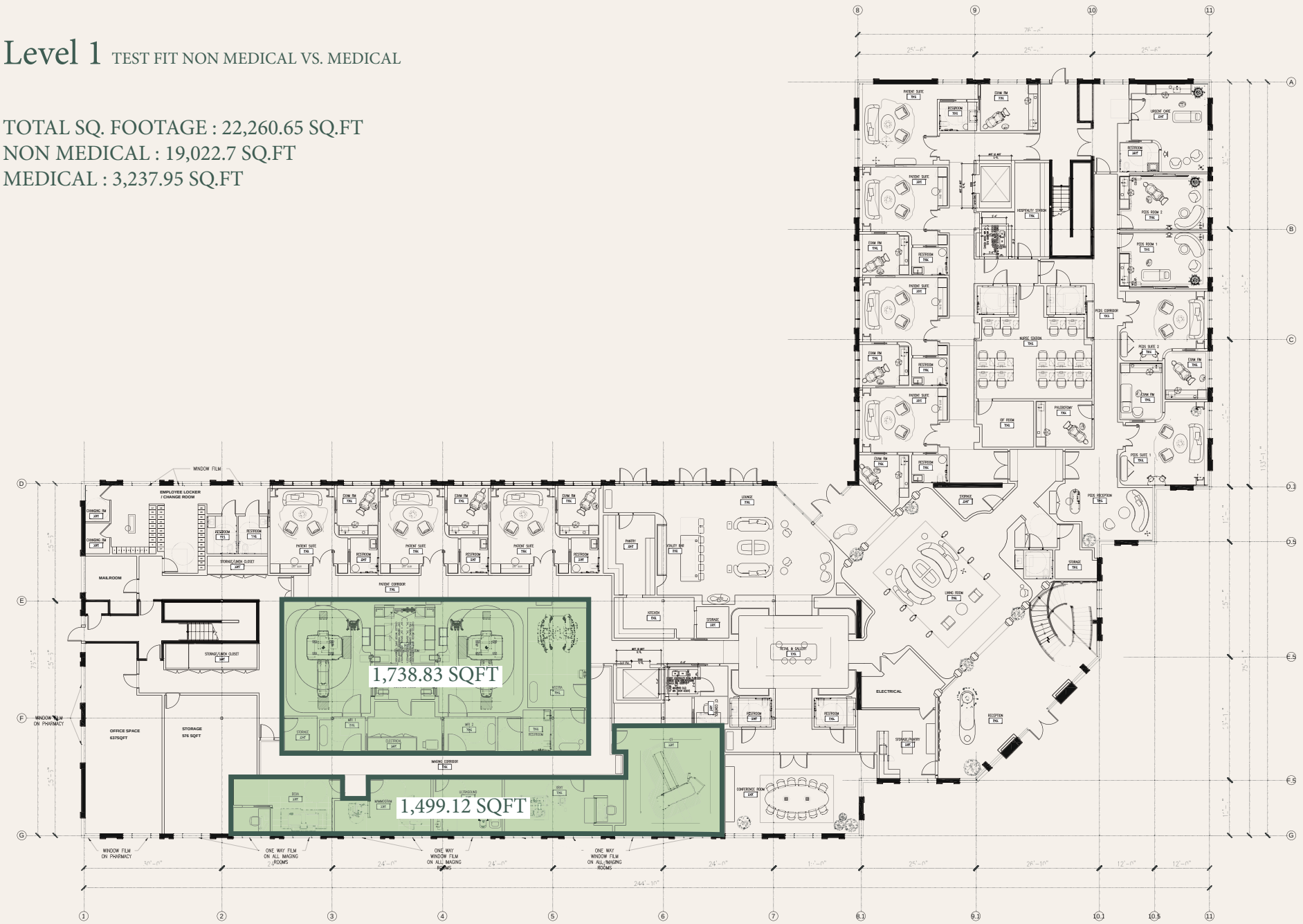


A16

Level 1 TEST FIT NON MEDICAL VS. MEDICAL

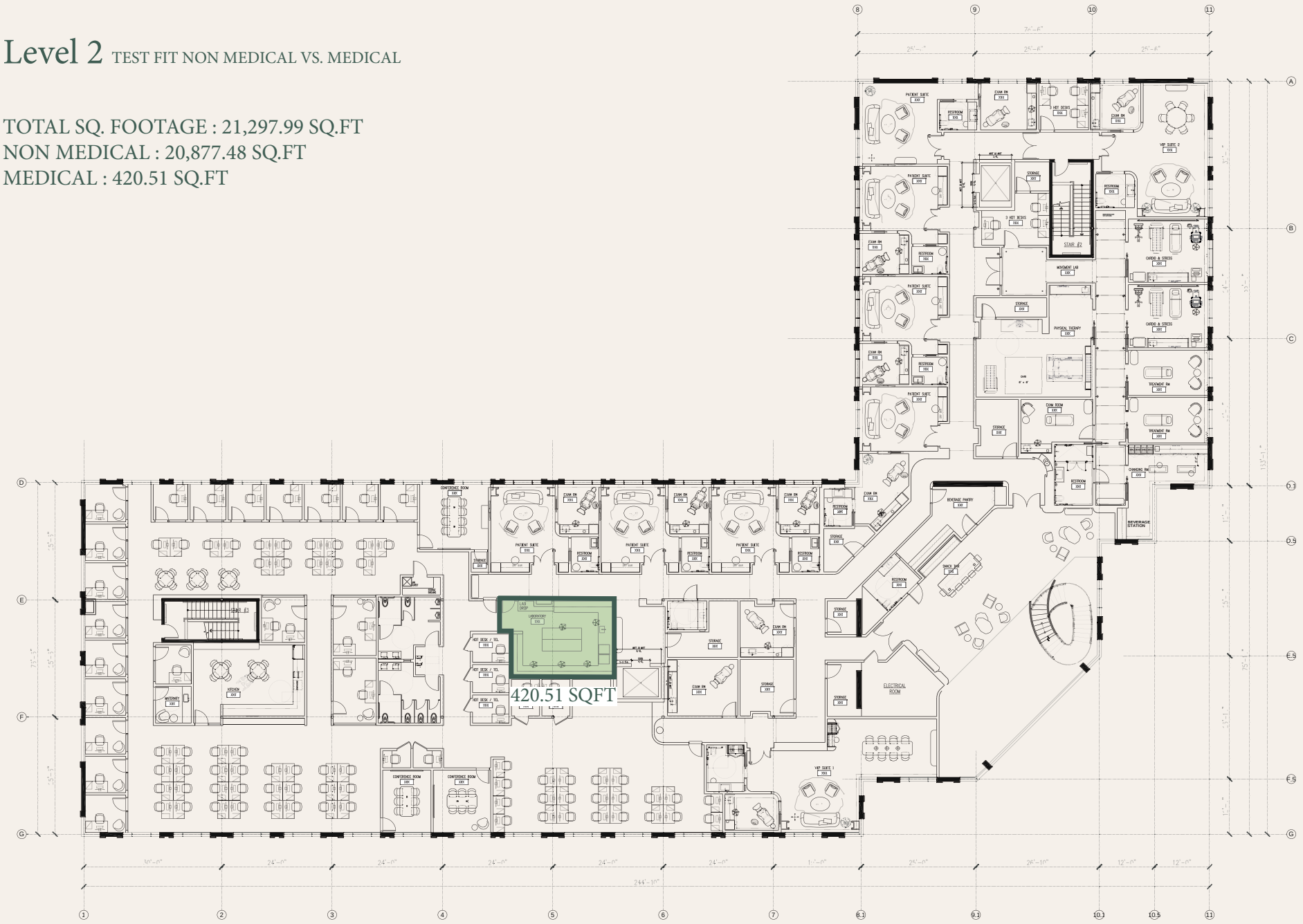
TOTAL SQ. FOOTAGE : 22,260.65 SQ.FT
NON MEDICAL : 19,022.7 SQ.FT
MEDICAL : 3,237.95 SQ.FT



A17

Level 2 TEST FIT NON MEDICAL VS. MEDICAL

TOTAL SQ. FOOTAGE : 21,297.99 SQ.FT
NON MEDICAL : 20,877.48 SQ.FT
MEDICAL : 420.51 SQ.FT



A18

Exterior Photos

*no exterior building changes planned











rockwellgroup

Reception RENDER



rockwellgroup

Stair RENDER



rockwellgroup

Living Room LOOK










Welcoming

·

Cocooned

·

Composed

rockwellgroup

Living Room RENDER



rockwellgroup

Retail LOOK











Curiosities
·
Curated
·
Established

rockwellgroup

Retail RENDER



rockwellgroup

Vitality Bar RENDER



rockwellgroup

Corridor RENDER



rockwellgroup

Movement Lab RENDER



rockwellgroup

Movement Lab CHANGING ROOM RENDER



rockwellgroup

Movement Lab CHANGING ROOM RENDER



rockwellgroup

Movement Lab TREATMENT ROOM RENDER



rockwellgroup

Conference Room RENDER



rockwellgroup

Conference Room RENDER



rockwellgroup

Imaging Center RENDER OPTION 2



rockwellgroup

PATIENT ROOM RENDER



rockwellgroup

February 17, 2026

City of Menlo Park
Planning Commission
701 Laurel Street
Menlo Park, CA 94025

Dear Planning Division,

On behalf of Atria Health and Research Institute, I respectfully request approval of a revision to the Use Permit originally granted in 1992, which excluded medical and dental office uses, for the property located at 333 Middlefield Road. We propose to establish our fourth flagship Atria Health Institute at this location, delivering personalized, preventive medical care to families in a comprehensive outpatient setting. The property is currently fully vacant. The prior second floor tenant vacated in Q4 2025, and no other tenants remain in occupancy. As part of this application, Atria will conduct proactive community outreach, including direct engagement with neighboring property owners and other interested stakeholders, to ensure transparency and address any questions regarding the proposed use.

Atria is redefining the patient's experience through a physician-led, data-driven approach that integrates advanced diagnostics, precision medicine, and continuous monitoring to optimize long-term health. With thriving Institutes in New York City and Palm Beach, and a third opening soon in Beverly Hills, we are now looking to bring our high-touch and low-volume model to Menlo Park, a city synonymous with innovation and science, with a community that prioritizes well-being and sustainability.

About the Project
Atria Bay Area will operate as a license-exempt "doctor's office" under California Health & Safety Code §1206, and, as such, will be subject to local building authority jurisdiction rather than under HCAI jurisdiction and OSHPD-3 certification. This facility provides non-invasive, non-emergency, outpatient services via private membership. Services are by appointment only, with operating hours from 8:00 AM to 6:00 PM, Monday through Friday. Daily staffing will range from 100 to 125 employees, while the maximum number of daily patient visits is 50. There will be no inpatient beds, surgical activity, or walk-in traffic—ensuring a tranquil, low-footprint operation. No building exterior or site layout changes will occur as part of this project. The interior will be built out per the provided Test Fit Plan attached to this document. This will be a combination of exam suites, offices, imaging rooms, and gathering spaces.

The Institute will feature

- A multi-story, all-electric facility offering preventive medical services and advanced diagnostics
- Health technology on-site for advanced imaging and testing
- Community engagement spaces for educational events, roundtables, and health-focused gatherings that are ancillary, limited, and complementary to the primary operation as a medical office. These spaces will be utilized sparingly throughout the year and will be invite only.
- Hospitality-forward design to foster a welcoming, high-quality care environment

Alignment with Menlo Park's Guiding Principles

We are deeply aware of Menlo Park's progressive stance on climate action, mobility, and environmental health, and we have thoughtfully designed this project to be a model of alignment with your city's values:

- **Sustainability and electrification**: Atria Bay Area will have several EV charging stations and will adhere to the city's latest and upcoming sustainability codes. We are committed to supporting Menlo Park's 2030 carbon-neutrality goals.

- **Mobility and traffic**: Our traffic-and-trip-generation study with Hexagon Transportation Consultants shows that Atria's operations will produce a comparable, and slightly lower, number of trips to the existing office use. This ensures that we will not increase congestion or undermine Menlo Park's vehicle miles traveled (VMT) reduction goals. We have also connected with WTrans via Jason Nesdahl and have a Traffic Impact Analysis completed in coordination with WTrans and the City of Menlo Park.

- **Zero emissions and landscaping**: All landscaping and maintenance operations will utilize zero-emission equipment, in full compliance with the City's 2023 gas-powered equipment ordinance.

- **Public health and community enrichment:** Atria will contribute to Menlo Park's broader public health goals by providing educational wellness events for the community and by partnering with local health equity organizations, as we do in New York and Palm Beach.

A Thoughtful Addition to Menlo Park

Atria Bay Area will be more than a health care facility. It will be a quiet, elegant space of healing, education, and long-term well-being. We are confident that the Institute will be a positive addition to the Menlo Park community and are eager to work in partnership with the City to meet all local planning and zoning requirements. Neighborhood outreach will be executed as required by the City of Menlo Park.

We respectfully ask for your support in approving the Change of Use permit and welcome any further dialogue to ensure alignment with city priorities. Thank you for your time and thoughtful consideration.

Warm regards,
Alan Tisch

Transportation Impact Study for the 333 Middlefield Road Project



Prepared for the City of Menlo Park

Submitted by
W-Trans

February 26, 2026

TRAFFIC ENGINEERING
TRANSPORTATION PLANNING
Balancing Functionality and Livability since 1995
w-trans.com

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Appendices

A. Intersection Level of Service Calculations

Executive Summary

The proposed project would result in the 43,559-square-foot building at 333 Middlefield Road being permitted to operate as a medical office space instead of the currently permitted general office use. There would be no change to the building envelope as most construction would occur inside with some minor outdoor improvements. Facilities would include 16 adult patient rooms, four pediatric patient rooms, and other auxiliary facilities such as imaging rooms, administrative offices, and lounge areas.

Using standard Institute of Transportation Engineers (ITE) trip generation rates for a medical office building, the project would be expected to generate 1,482 average daily trips, including 140 trips during the a.m. peak hour and 149 trips during the p.m. peak hour. However, based on project-specific data provided by the applicant, a more refined estimate indicates for this project specifically, that there would be approximately 429 average daily trips, including 91 morning peak hour trips and 47 trips during the evening peak hour.

The project would not conflict with adopted plans or policies related to pedestrian, bicycle, or transit facilities. Given the size and that its travel characteristics are substantially similar to those of a local-serving retail use, the project is exempt from quantitative vehicle miles traveled analysis. From a safety perspective, adequate sight distance is available at the proposed site driveways, turn lanes effectively already exist, and the potential for cut-through traffic in adjacent neighborhoods is negligible. Emergency access would not be adversely affected as the project would be required to obtain approval from the fire code official as part of the permitting process, and emergency vehicles are equipped with lights, sirens, and signal preemption devices that enable them to bypass congestion when necessary.

Traffic operations were evaluated under Near-Term and Cumulative volume scenarios. The addition of project traffic would not create a project-specific deficiency at any of the 16 study intersections. Although the critical movement delay would increase by more than the 0.8-second significance threshold at the Ravenswood Avenue/Laurel Street intersection during the p.m. peak hour under Near-Term plus Project and Cumulative plus Project conditions, and at the Willow Road/Middlefield Road intersection during the p.m. peak hour under Cumulative plus Project conditions, these increases can be addressed through routine signal retiming. As such, they would not constitute deficiencies of the project.

The proposed parking supply of 161 spaces would not satisfy the City of Menlo Park's requirement for 218 spaces, but would exceed the anticipated demand of 115 spaces, thereby resulting in a negligible likelihood of parking spillover into nearby neighborhoods. It is therefore recommended that the applicant work with the City to secure approval for the parking shortfall. Seven accessible parking spaces are proposed, exceeding the ADA minimum requirement for six such spaces. However, while two van-accessible spaces are required when seven accessible spaces are provided, only one is currently identified on the site plan as van accessible. It is recommended that the site plan be revised to show that the second existing van-accessible parking space would remain.

Introduction

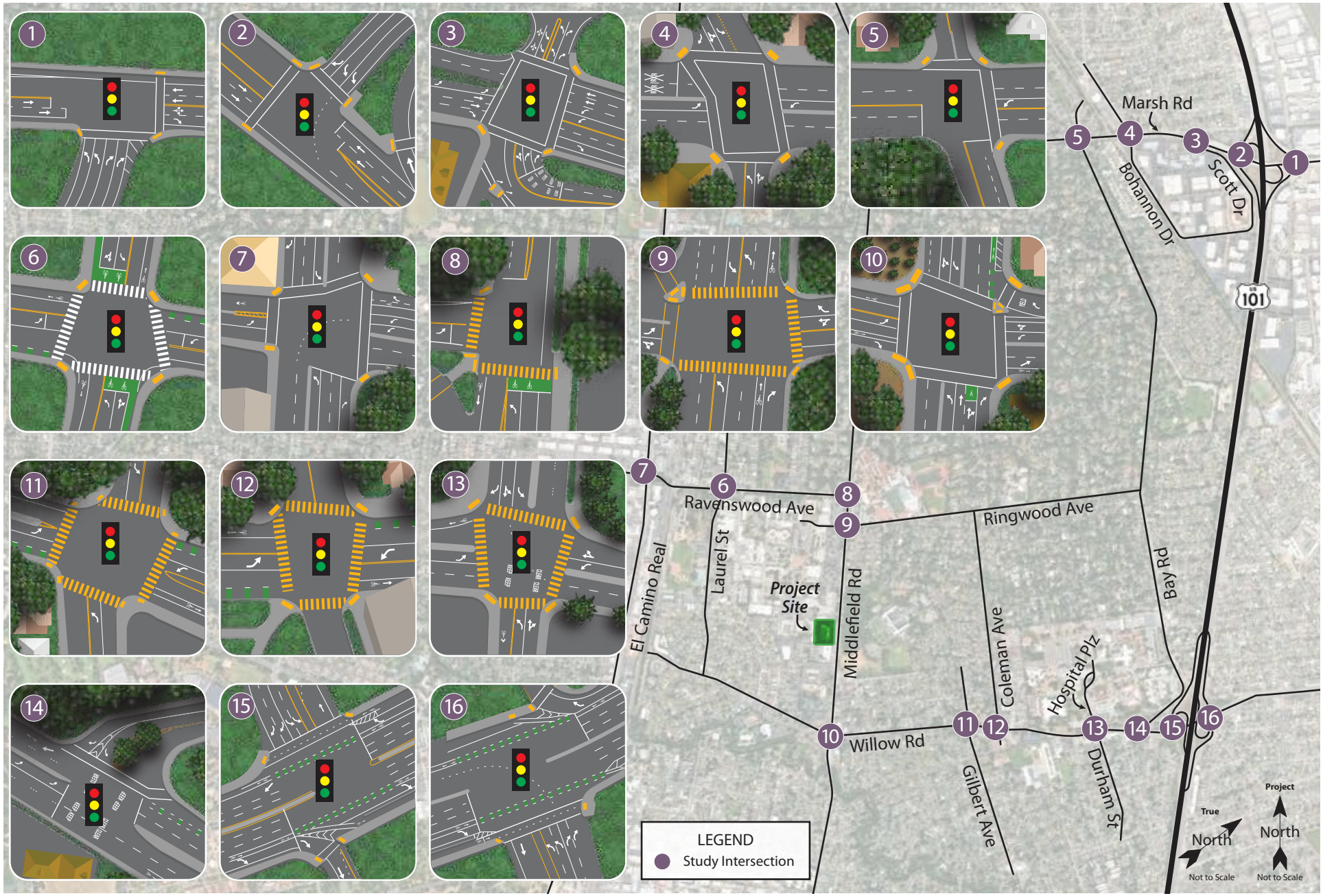
This report presents an analysis of the potential traffic impacts and adverse operational effects that would be associated with the proposed project located at 333 Middlefield Road in the City of Menlo Park. The project proposes to allow medical office use in an existing office building that currently prohibits such use. The traffic study was completed in accordance with the criteria established by the City and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a traffic impact study is to provide City staff and policy makers with data that can be used to make an informed decision regarding the potential transportation impacts of a proposed project, and any associated improvements that would be required to mitigate these impacts to an acceptable level under California Environmental Quality Act (CEQA), the City's General Plan, or other policies. This report provides an analysis of those items that are identified as areas of environmental concern under the CEQA. Access for pedestrians, bicyclists, and to transit, potential safety concerns such as adequacy of sight distance and the need for turn lanes, and emergency access were also assessed. Vehicular traffic service levels at key intersections were evaluated for consistency with General Plan policies by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on anticipated travel patterns specific to the proposed project, then analyzing the effect the new traffic would be expected to have on the study intersections and need for improvements to maintain acceptable operation. Adequacy of parking is also addressed as a policy issue.

Project Profile

The project would allow for the reuse of an existing 43,559-square-foot office building for medical offices. No modifications to the building envelope or floor area are proposed. The project site is located at 333 Middlefield Road, as shown in Figure 1.



mpa905-1.ai 2/26

Transportation Impact Study for the 333 Middlefield Road Project

Figure 1 – Study Area and Existing Lane Configurations

A45

Transportation Setting

Study Area and Periods

The study area varies depending on the topic. For pedestrian trips it typically consists of all streets within a half mile of the project site that would lie along primary routes of pedestrian travel, or those leading to nearby generators or attractors. This distance corresponds to around ten to 15 minutes of travel and captures most (75 percent of) pedestrian trips per data from *Report 770: Estimating Bicycling and Walking for Planning and Project Development: A Guidebook*, National Cooperative Highway Research Program, 2014. For bicycle trips it consists of all streets within one mile of the project site that would lie along primary routes of bicycle travel as this distance covers many casual trips made on bicycle. For the safety and operational analyses it consists of the project frontage and the following intersections.

1. Marsh Road/US 101 North Off-Ramp
2. Marsh Road/US 101 South Off-Ramp
3. Marsh Road/Scott Drive
4. Marsh Road/Florence Street-Bohannon Drive
5. Marsh Road/Bay Road
6. Ravenswood Avenue/Laurel Street
7. Ravenswood Avenue/El Camino Real
8. Ravenswood Avenue/Middlefield Road
9. Ringwood Avenue/Middlefield Road
10. Willow Road/Middlefield Road
11. Willow Road/Gilbert Avenue
12. Willow Road/Coleman Avenue
13. Willow Road/Durham Street-VA Hospital
14. Willow Road/Bay Road
15. Willow Road/US 101 South Ramps
16. Willow Road/US 101 North Ramps

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute. Traffic counts were obtained for the study intersections on November 19, 2024, and December 4, 5, and 11, 2024.

Study Intersections

Marsh Road/US 101 North Off-Ramp is a three-legged, signalized intersection with crosswalks and pedestrian phasing on the north and east legs. As there are no left turns from Marsh Road onto the US 101 North on-ramps, the signal has two-phase permissive operation alternating between the Marsh Road approaches and US 101 North Off-Ramp approach.

Marsh Road/US 101 South Off-Ramp is a signalized intersection with three legs and pedestrian crossings and phasing on the west and south approaches. This signal also operates with two-phase operation between the Marsh Road approaches and US 101 South Off-Ramp approach.

Marsh Road/Scott Drive is a signalized, four-legged intersection with split phasing on Scott Drive and protected left-turn movements on Marsh Road. Marked crosswalks and pedestrian phases are on all approaches.

Marsh Road/Florence Street-Bohannon Drive is a four-leg, signal-controlled intersection with protected left turns on each Marsh Road approach, split phasing on Florence Street and Bohannon Drive, and pedestrian crossings on all legs.

Marsh Road/Bay Road operates as a four-legged, signalized intersection with permissive phasing on both Bay Road approaches and a protected southbound left turn from Marsh Road that operates concurrently with a right-turn overlap on westbound Bay Road. Crosswalks and pedestrian phases exist on the north and west legs.

Ravenswood Avenue/Laurel Street is a four-legged, signalized intersection with protected-permissive phasing on both Ravenswood Avenue approaches and split phasing for the Laurel Street approaches. The intersection has crosswalks and pedestrian phases on all four legs.

Ravenswood Avenue/El Camino Real is a four-legged, signalized intersection with protected left turns on both El Camino Real approaches and split phasing on Ravenswood Avenue. The intersection has crosswalks on all legs except the east.

Ravenswood Avenue/Middlefield Road is a three-legged, signalized intersection with a protected northbound left-turn from Middlefield Road. Crosswalks serve the south and east legs.

Ringwood Avenue/Middlefield Road is a four-legged intersection with signal control and protected left-turn phasing on Middlefield Road and permissive phasing on Ringwood Avenue. Pedestrian crossings and phases are on all approaches.

Willow Road/Middlefield Road is a signalized, four-leg intersection operating under split phasing for all approaches, with crosswalks and pedestrian phases on every leg.

Willow Road/Gilbert Avenue is a four-legged, signalized intersection with permissive phasing on all four approaches. The intersection has crosswalks on all four legs.

Willow Road/Coleman Avenue operates as a signalized, four-leg intersection with permissive phasing and crosswalks with pedestrian phases on all four approaches.

Willow Road/Durham Street-VA Hospital is a four-legged, signalized intersection with split phasing on the Durham Street and VA Hospital approaches and protected left turns on Willow Road. Pedestrian crossings are present on all legs.

Willow Road/Bay Road is a three-legged, signalized intersection with a protected left turn on the eastbound Willow Road approach. The intersection has a crosswalk on the north leg only.

Willow Road/US 101 South Ramps is a three-legged, signalized intersection that accommodates vehicular access to the southbound freeway ramps and includes a crosswalk on the west leg. The westbound and southbound right turns have protected phasing.

Willow Road/US 101 North Ramps is a three-legged, signalized intersection providing access to the northbound freeway ramps, with a pedestrian crossing on the east leg only. There is protected phasing for the eastbound and northbound right turns.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

Existing Transportation Facilities

Existing and Planned Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site.

Per the *City of Menlo Park Transportation Master Plan,* 2020, pedestrian intersection improvements are planned along Middlefield Road at Ravenswood Avenue, Ringwood Avenue, and Santa Monica Avenue. Improvements include new curb ramps, crosswalks, and push buttons to improve visibility.

Existing and Planned Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2025, classifies bikeways into four categories:

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.
- **Class IV Bikeway** – also known as a separated bikeway, a Class IV Bikeway is for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

Table 1 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *City of Menlo Park Transportation Master Plan*.

Table 1 – Bicycle Facility Summary

Status Location	Class	Length (miles)	Begin Point	End Point
Existing				
Middlefield Rd*	II	1.8	Marsh Rd	Willow Rd
Ravenswood Ave	II	0.5	Middlefield Rd	Alma St
Linfield Dr	II	0.2	Middlefield Rd	Waverley St
Ringwood Ave*	II	0.9	Middlefield Rd	Bay Rd
Willow Rd	II	1.4	Alma St	Okeefe St
Laurel St	II	0.9	Encinal Ave	Burgess Dr
Laurel St	III	0.2	Burgess Dr	Willow Rd
Planned				
Laurel St	II	0.2	Burgess Dr	Willow Rd
Coleman Ave*	II	0.7	Ringwood Ave	Willow Rd
Seminary Dr	III	0.6	Middlefield Rd	Santa Monica Ave
Santa Monica Ave	III	0.5	Coleman Ave	Middlefield Rd
Linfield Dr	III	0.2	Waverley St	Laurel St

Note: * All or portions of these bikeways are located within the Town of Atherton
Source: *City of Menlo Park Transportation Master Plan*, 2020

Existing Transit Facilities

Commute.org and SamTrans provide fixed route bus service in Menlo Park near the project site. Existing transit routes and their operation are summarized in Table 2.

Table 2 – Transit Routes					
Transit Agency Route	**Distance to Stop (mi)[1]**	**Service**			**Connection**
		Days of Operation	**Time**	**Frequency**	
Commute.org (Caltrain Shuttle)					
M4 Shuttle	0.1	Weekdays	7:53 AM – 9:53 AM 4:15 PM – 6:29 PM	1 hour 1 hour	Menlo Park Caltrain
SamTrans					
Route 296	0.1	Daily	6:00 AM – 9:30 PM	15 minutes	Redwood City Transit Center
Route 296O	0.1	Weekdays Weekends	10:00 PM – 1:30 AM 9:43 PM – 1:43 AM	1 hour 1 hour	Redwood City Transit Center
Route 397	0.1	Daily	1:30 AM – 4:15 AM	1 hour	Palo Alto Transit Center

Note: [1] Defined as the shortest walking distance between the project site and the nearest bus stop
Sources: Commute.org, SamTrans

Caltrain shuttles are wheelchair-accessible and equipped with a bicycle rack on the front of the vehicles. SamTrans buses are equipped with bike racks, which hold three bicycles, with space inside for up to two additional bikes.

Dial-a-ride, also known as paratransit, or curb-to-curb service, is available for those who are unable to independently use the transit system due to a physical or mental disability. The City of Menlo Park's "Shoppers' Shuttle" is designed to serve the needs of individuals with disabilities within the Menlo Park, Palo Alto, and Redwood City areas.

Project Data

The project would result in the permitted reuse of the currently vacant 43,559-square-foot building at 333 Middlefield Road, Menlo Park, from general office to medical office space. The interior would be redeveloped, however no change to the building envelope and floor area would occur. There would be 16 adult patient rooms, four pediatric patient rooms, and other auxiliary facilities such as imaging rooms, administrative offices, and lounge areas. An on-site pharmacy would be available to fulfill prescription needs during appointments, however it would not be accessible to the general public or those who do not have an appointment that day. There would not be pharmacology or medical vendor sales occurring on the site.

The proposed project site plan is shown in Figure 2.

Trip Generation

Institute of Transportation Engineers' Rates

The anticipated trip generation for the proposed project was estimated first by using standard trip generation rates, and then by using project-specific data. The first estimate was calculated using rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 12th Edition, 2025, for "Medical-Dental Office Building" (LU #720), to estimate the potential trip generation of converting the general office building to a medical office use. As shown in Table 3, this would result in an estimated generation of 1,482 trips per day, including 140 trips during the a.m. peak hour and 149 p.m. peak hour trips.

Table 3 – Trip Generation Summary – ITE Rates

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Medical Office Building	43.559 ksf	34.03	1,482	3.21	140	109	31	3.42	149	45	104

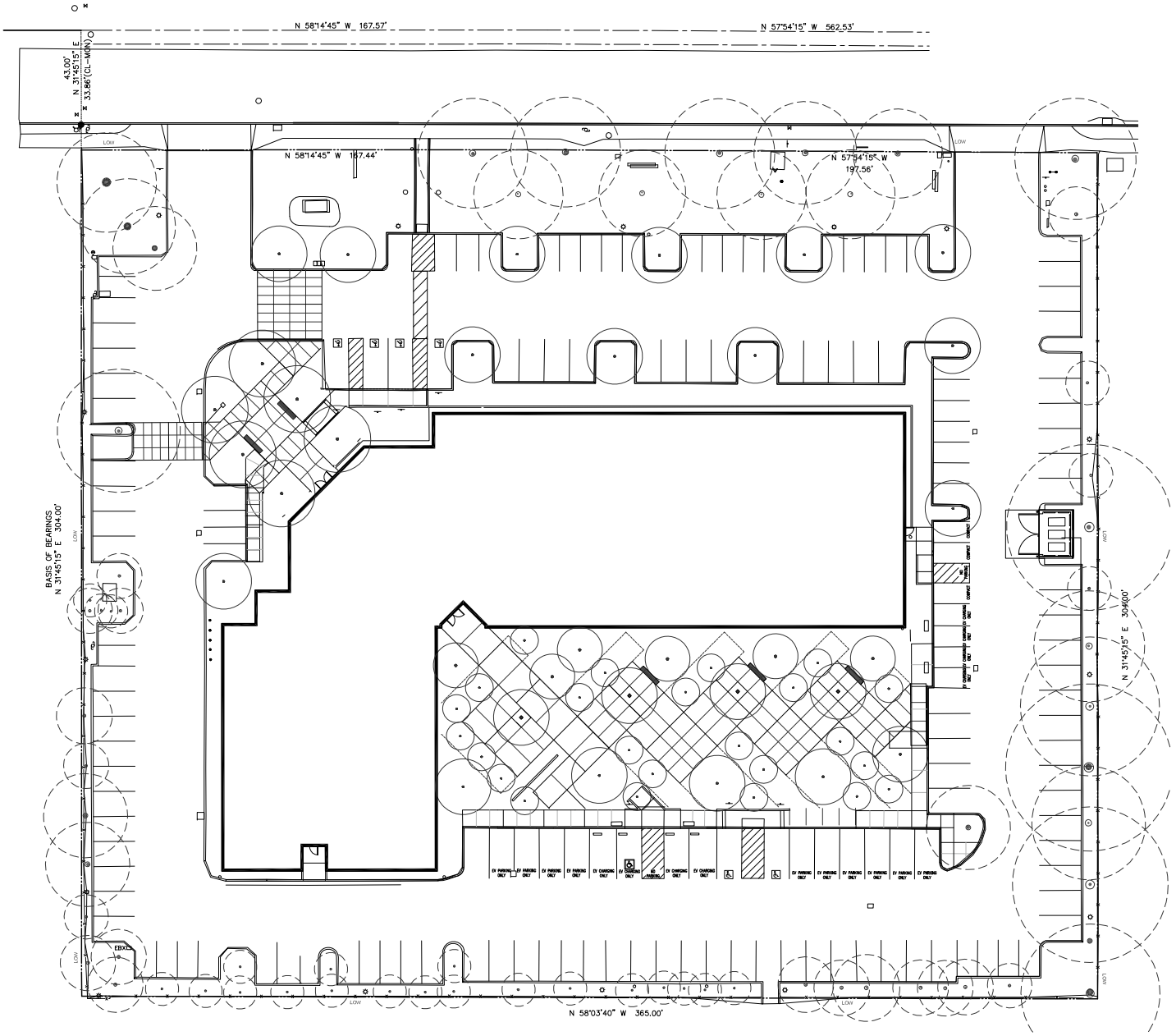
Notes: ksf = 1,000 square feet; Actual size of project is less but the calculated trips were based on the original size of the proposed project.

The trip generation forecast based on ITE rates was used for the operational analysis; however, a slightly larger floor area was assessed that resulted in six extra project trips during each peak hour. As the actual project would result in fewer trips, the analysis was retained as it would conservatively overestimate the potential effect of project traffic in the study area. It is noted that a credit for the existing office use was not included as this use was vacant at time that traffic counts were collected in November and December 2024.

Project-Specific Rates

A trip generation forecast was also calculated for informational purposes based on the project description and data provided by the applicant. This forecast is specific to the proposed project's business model and the Menlo Park site.

Data provided by the applicant indicates that 40 to 50 patients would be served per weekday, with at most 10 patients on-site at a time. Patient visits would occur between 8:00 a.m. and 6:00 p.m. Monday to Friday, with the typical duration of stay lasting one to two hours, and no overnight or weekend stays. There would be a total of 100 to 125 staff on site on a daily basis, consisting of 30 to 40 administrative personnel, 30 physicians, and around 55 support staff and technicians. The staff would be generally exclusive to the site (e.g., not traveling to other medical centers or hospitals), though up to three employees may conduct house calls requiring leaving the site then later returning. The administrative staff and physicians would work during all business hours, 8:00 a.m. and 6:00 p.m., whereas the support staff would be split between an 8:00 a.m. to 4:30 p.m. shift and a 9:30 a.m. to 6:00 p.m. shift. Up to five deliveries per day are anticipated, such as USPS, parcel mail, medical suppliers, and a lab pickup that would occur at the end of the day.



Source: DES Acrhitects + Engineers, 9/25

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Transportation Impact Study for the 333 Middlefield Road Project

Figure 2 – Site Plan

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This trip generation was divided into patient, staff, and delivery trips, and where ranges were provided, the upper bound was selected to present a more conservative estimate. For patient trips, the upper bound of 50 patients per day was used to assume 100 daily trips, with one in and one out per patient. Based on arrival and departure data for the applicant's New York City location, while the maximum load of ten patients at once may arrive during the peak hour for appointments starting at 8:00 a.m., the average number of patients leaving during the same peak hour would be estimated as three. For the p.m. peak hour, the upper bound of ten patients served per hour were assumed to leave, along with three arrivals for appointments late in the day. Based on this activity profile, the estimated trip generation for patients would be 13 in the a.m. peak hour (ten in and three out), and 13 in the p.m. peak hour (three in and ten out).

Staff were assumed to generate an average of 2.5 trips per day, from one trip in and one trip out per each staff member, plus an estimate that one in four staff on average would leave the site and return in the middle of the workday to get lunch, go to an appointment, or for any other purpose. With up to 125 staff, this would result in 313 trips per day. Additionally, six trips were added to account for the three house calls (three round trips, making for six total trips), bringing the total to 319 staff trips each weekday.

To estimate the peak hours, the staff were divided into administrative staff, physicians, and support staff. Understanding that there would be up to 125 staff with up to 40 being administrative staff, 30 physicians, and 55 support staff. These support staff would be divided evenly into two shifts, with about 28 employees per shift. All administrative staff (40), the first shift of support staff (28) and one physician per patient (10) were assumed to arrive during the a.m. peak hour for 78 inbound employee trips total. For the evening peak hour which ends by 6:00 p.m., it was assumed that a quarter of staff would leave as this would cover the first shift of support staff whose shift ends at 4:30 p.m., and a few other staff who would leave early (those with shifts that otherwise end at 6:00 p.m.). This would result in a forecast of 32 outbound trips for employees during the p.m. peak hour.

For delivery trips, ten daily trips are assumed given that there would be up to five deliveries, with five ins and five outs (ten trips per day total). It was assumed that these would generally occur midday, with no peak hour deliveries other than the lab pickup that would occur at the end of the day (conservatively estimated to occur during the p.m. peak hour).

In total, an average of 429 trips per day were estimated using project-specific information provided by the applicant, including 91 morning peak hour trips and 47 trips during the evening peak hour. Table 4 includes a tabulation of the trips by site user and time of day.

Table 4 – Trip Generation Summary

Site User	Units	Daily	AM Peak Hour			PM Peak Hour		
		Trips	Trips	In	Out	Trips	In	Out
Patients	50	100	13	10	3	13	3	10
Staff	125	319	78	78	0	32	0	32
Deliveries	5	10	0	0	0	2	1	1
TOTAL		**429**	**91**	**88**	**3**	**47**	**4**	**43**

Trip Distribution

The trip distribution assumptions were developed based on anticipated origins and destinations for new trips as well as knowledge of local travel patterns. Table 5 shows the application of these distribution assumptions to the estimated trip generation using ITE rates, and the resulting trips.

Table 5 – Trip Distribution Assumptions				
Route	**Percent**	**Daily Trips**	**AM Peak**	**PM Peak**
US 101 North of Marsh Rd via Marsh Rd	15%	222	21	22
US 101 North of Marsh Rd via Willow Rd	5%	74	7	7
US 101 South of Willow Rd	30%	446	42	46
Willow Rd East of US 101	20%	296	28	30
Middlefield Rd North of Ravenswood Ave	10%	148	14	15
Middlefield Rd South of Willow Rd	5%	74	7	7
El Camino Real North of Ravenswood Ave	5%	74	7	7
El Camino Real South of Ravenswood Ave	10%	148	14	15
TOTAL	100%	1,482	140	149

Circulation System

This section addresses the potential for a project to conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

Pedestrian Facilities

Relevant Policies

The *City of Menlo Park General Plan*, 2016, contains two relevant policies with respect to pedestrian facilities.

- **Policy CIRC-1.8 Pedestrian Safety.** Maintain and create a connected network of safe sidewalks and walkways within the public right of way ensuring that appropriate facilities, traffic control, and street lighting are provided for pedestrian safety and convenience, including for sensitive populations.
- **Policy CIRC-2.7 Walking and Biking.** Provide for the safe, efficient, and equitable use of streets by pedestrians and bicyclists through appropriate roadway design and maintenance, effective traffic law enforcement, and implementation of the City's Transportation Master Plan (following completion; until such time the Comprehensive Bicycle Development Plan, Sidewalk Master Plan and the El Camino Real/Downtown Specific Plan represent the City's proposed walking and bicycling networks).

Site Design

A sidewalk exists along the project site frontage on Middlefield Road. A pedestrian path connects the existing sidewalk to the building entrance via a walkway and striped crosswalk in the front parking area.

The project would not result in any changes to the existing on-site pedestrian facilities.

Project Impacts on Pedestrian Facilities

Finding – The project would not conflict with any policies related to pedestrian facilities.

Bicycle Facilities

Relevant Policies

The *2025 California Green Building Standards Code, Title 24, Part 11*, requires that new, addition, or alteration projects with visitor traffic provide bicycle racks near (within 200 feet) of the visitors' entrance for 20 percent of the peak daily visitor count, including a minimum capacity for two bicycles. However, there is an exemption for additions or alterations that add fewer than ten visitor vehicle parking spaces. Long-term bicycle parking is only required for new buildings with ten or more tenant-occupants, such as employees.

General Plan Policy CIRC-2.7 Walking and Biking cited above also applies to bicycle facilities.

Site Design

The existing site does not include bicycle parking. The proposed site plan would not add bicycle parking or result in any changes to existing on-street bicycle facilities.

Project Impacts on Bicycle Facilities

Existing bicycle facilities, including bike lanes on Middlefield Road, would not be altered by the project, precluding a potentially significant impact to these facilities.

The project would not result in the addition of new vehicle parking spaces. Short-term bicycle parking requirements would therefore not apply because the project would be adding fewer than ten visitor vehicle parking spaces. Long-term bicycle parking requirements would also not be applicable as the project would not result in construction of a new building but rather the repurposing of an existing one.

Finding – The project would not conflict with applicable policies regarding bicycle facilities.

Transit Facilities

Relevant Policies

Several SamTrans routes traverse Middlefield Road adjacent to the project site. The *Short Range Transit Plan*, SamTrans, December 2022, contains a variety of planning scenarios for altering service at a programmatic level.

Site Design

The proposed site plan would not result in any changes to existing transit facilities, or to Middlefield Road as it would involve repurposing an existing building rather than new construction.

Impact on Transit Facilities

The project would not affect the ability for SamTrans to implement its *Short Range Transit Plan*.

Finding – The project would not conflict with adopted plans and policies regarding transit facilities.

Vehicle Miles Traveled (VMT)

The potential for the project to conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b) was evaluated based the project's anticipated Vehicle Miles Traveled (VMT).

A retail project resulting in an increase to the region's total VMT may reflect a significant impact. Research has shown that local-serving commercial uses, typically those under 50,000 square feet in size, and infill retail developments tend to *shift* where vehicle trips occur rather than generate wholly new trips (with a corresponding shift in vehicle miles traveled). This premise is supported by the California Office of Planning and Research (OPR) in its publication *Technical Advisory on Evaluation Transportation Impacts in CEQA*, December 2018. The *Transportation Impact Analysis Guidelines* (TIAG), City of Menlo Park, July 2020, concurs that local-serving retail projects of 50,000 square feet or less are exempt from VMT analysis.

While the language of OPR and City refers to commercial retail use, the same logic may be applicable to other local-serving land uses such as commercial services, daycare centers, and in this case, medical office buildings. Generally, users of these sites patronize the closest appropriate option, and therefore construction of additional locations of similar land use would reduce the lengths of existing trips being taken, rather than creating new long-distance trips. Because the proposed project is less than 50,000 square feet and would be expected to shift *where* people seek clinical medical services rather than increase the amount of new medical services demanded, it is reasonable to presume that total regional VMT would not increase as a result of the project and it may be considered functionally equivalent to local-serving commercial retail for the purpose of evaluating VMT.

It is noted that the project would result in rezoning the 43,559-square-foot commercial office building to medical offices. This falls under the 50,000-square-foot threshold specified by the City and OPR. However, there is a potential project element where only around 10,000 square feet would be classified as medical offices, with the remainder remaining as commercial offices. The TIAG specifies that projects with multiple components are to have each component analyzed separately against the appropriate threshold. For the medical office component, the same exemption would apply as it would be under 50,000 square feet. For the remainder, by inspection there would be no impact to VMT as the existing land use would remain.

Significance Finding – The project would be expected to screen out from quantitative VMT analysis as it would have travel characteristics substantially similar to a local-serving commercial retail use, and therefore can be presumed to have a less-than-significant impact on VMT.

Safety Issues

The potential for the project to affect safety was evaluated in terms of the adequacy of sight distance, need for turn lanes at the project accesses, and potential to generate cut-through traffic.

Site Access

The project would use the existing two driveways on Middlefield Road, approximately 130 feet and 410 feet south of Survey Lane. No changes to the existing driveways are proposed. Middlefield Road along the project frontage includes one vehicle travel lane and a buffered bicycle lane in each direction, with a two-way left-turn lane. The buffered bicycle lane fronting the project site is ten feet wide and includes painted elements – no physical barriers are present.

Sight Distance

Sight distance along Middlefield Road was evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distance at intersections of public streets, private streets, and rural driveways is based on corner sight distances with the approach travel speeds used as the basis for determining the recommended sight distance and more sight distance needed for left turns compared to right turns. Additionally, the stopping sight distance needed for a following driver to stop if there is a vehicle waiting to turn into a side street or driveway is evaluated based on stopping sight distance criterion and the approach speed on the major street. Sight distances at the driveways were field measured. Although sight distance requirements are not applicable to urban driveways, the stopping sight distance criterion was applied for evaluation purposes.

Middlefield Road has a posted speed limit of 30 miles per hour (mph), which requires a minimum stopping sight distance of 200 feet. The speed of southbound traffic was informally surveyed, and the critical speed was determined to be 42 mph. At 45 mph, the required minimum sight distance is 360 feet. Field measurements were obtained to and from the position of a vehicle waiting at the locations of the driveway approaches, and it was determined that over 360 feet of sight distance exists in both directions, so there is adequate stopping sight distance at the project driveway locations.

Similarly, a following driver would have more than 360 feet of stopping sight distance to a driver turning into the project driveways from either direction, so would be able to observe and react to a vehicle slowing or stopping while turning into the project driveway. Therefore, there is adequate sight distance for vehicles turning into or out of the project site.

Access Analysis

As there is an existing two-way left-turn lane on Middlefield Road adjacent to the project site, dedicated space for vehicles turning left into the site is already available. Likewise, the existing ten-foot buffered bicycle lane and gutter would enable operation similar to a separate, dedicated right-turn taper in absence of these facilities. Further, drivers turning into the proposed project site are required by law to turn from the rightmost lane, including the bike lane. Likewise, the absence of a dedicated right-turn lane or taper would provide a traffic calming benefit by requiring through drivers to accommodate drivers turning right, as is the case at all other driveways on Middlefield Road in the City of Menlo Park. Therefore, for these reasons, the absence of dedicated turning facilities into the project would not constitute a potential safety concern of the project.

Cut-Through Potential

Cut-through traffic occurs when drivers take a less direct route through local streets to avoid traffic on nearby major streets. In the project area, this may include drivers routing between Middlefield Road and US 101 using Ringwood Avenue, Coleman Avenue, and/or Bay Road instead of only Marsh Road or Willow Road. One concern with any project on Middlefield Road is the potential to contribute towards this phenomenon. However, it would be reasonable to conclude that the project is unlikely to generate cut-through traffic due to several factors. One

is the project's proximity to Willow Road. For example, the driving distance between the site and Willow Road/US 101 South Ramps is 1.35 miles via just Middlefield Road and Willow Road, 1.90 miles using Ringwood Avenue and Coleman Avenue, and 2.15 miles with Ringwood Avenue and Bay Road. Another factor is that San Mateo County and the City of Menlo Park recently completed a study of Coleman Avenue and Ringwood Avenue, with a common goal of lowering speeds and improving bicycle and pedestrian facilities on these streets. Ultimately, if the recommendations are funded and implemented, the potential for cut-through traffic would be reduced. Further, the project would be repurposing an existing use, so would not materially change the flow of traffic on the surrounding network compared to the prior use.

Finding – The proposed project would minimally affect transportation safety as the site has adequate site distance, there is space for turning vehicles to enter the project site out of the way of through traffic, and the project would negligibly affect cut-through traffic volumes.

Emergency Access

This section focuses on whether the project would result in inadequate emergency access or not.

Adequacy of Site Access

The project would only include minor adjustments to the site outside of the building envelope, such as adding electric vehicle charging terminals and replacing the trash enclosure. Otherwise, the existing site layout would be maintained with the project. As the existing site required approval from the fire code official to be constructed, and approval of the site plan would need to be secured from the fire code official again as part of the permitting process, the design would be ensured to meet adopted standards.

Off-Site Impacts

As detailed in the "Capacity Analysis" chapter in this report, the addition of project traffic to Near-Term or Cumulative volumes would not cause an intersection operating acceptably to degrade to a deficient level. Emergency vehicles have lights and sirens to bypass queued traffic and minimize the effects of intersection delay, alongside signal preemption equipment to prompt green indications and enable traffic to clear out of the way. Further, the project would repurpose an existing building that was formerly occupied by an office use and could be reoccupied in a similar manner at any time by right. As such, traffic associated with this specific project would not constitute a novel presence on the roadway network. Therefore, the project can be presumed to have a negligible effect on emergency response times.

Finding – The proposed project would be designed to accommodate emergency response vehicles and would not impede emergency responders, resulting in an immaterial effect on emergency response.

Capacity Analysis

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), 7th Edition, Transportation Research Board, 2022. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle. The study intersections are all currently controlled by traffic signals, so were evaluated using the signalized methodology from the HCM. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether the signals are coordinated or not, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, delays were calculated using traffic signal timing data obtained from the City of Menlo Park.

The ranges of delay associated with the various levels of service are indicated in Table 6.

Table 6 – Signalized Intersection Level of Service Criteria	
LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual*, Transportation Research Board, 2022

Traffic Operation Standards

Per the City's TIAG, LOS A through LOS C is considered acceptable for collector streets while LOS D is also considered acceptable for arterials. It is understood through direction from City staff and review of prior studies for projects within the City that the collector street threshold applies to "lower" order facilities such as local streets, that the arterial standard applies to "higher" order facilities like expressways and freeways, and that the intersections of two streets of varying classification should be reviewed using the highest order facility present (e.g. that LOS D is acceptable at the intersection of a collector and an arterial). In the study area, all intersections have at least one arterial approach and therefore the standard is LOS D or better, except for Marsh Road/Florence Street-Bohannon Drive and Marsh Road/Bay Road, for which the collector threshold of LOS C or better applies.

For project deficiencies, an adverse effect is considered to occur if the addition of project traffic to an intersection operating acceptably would increase average intersection delay by 23 seconds or greater, or degrade the intersection LOS to an unacceptable level (LOS D, E, or F for collectors; LOS E or F for arterials). For intersections already operating deficiently without project traffic, an adverse effect would occur if the addition of trips associated with the project would increase the average delay for vehicles on the critical movement by more than 0.8 seconds.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Volume data was collected on November 19, 2024, and December 4, 5, and 11, 2024, while local schools were in session.

Under existing conditions, all intersections are operating acceptably overall except for Ravenswood Avenue/Laurel Street during the p.m. peak hour and Willow Road/US 101 South Ramps during the a.m. peak hour. The existing traffic volumes are shown in Figure 3. A summary of the intersection Level of Service calculations is contained in Table 7, and copies of the calculations are provided in Appendix A.

Table 7 – Existing Peak Hour Intersection Levels of Service

Study Intersection	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
1. Marsh Rd/US 101 N Off-Ramp	17.2	B	17.1	B
2. Marsh Rd/US 101 S Off-Ramp	20.2	C	22.3	C
3. Marsh Rd/Scott Dr	16.9	B	19.6	B
4. Marsh Rd/Florence St-Bohannon Dr	30.7	C	33.6	C
5. Marsh Rd/Bay Rd	18.4	B	21.5	C
6. Ravenswood Ave/Laurel St	38.9	D	**59.1**	**E**
7. Ravenswood Ave/El Camino Real	36.0	D	28.6	C
8. Ravenswood Ave/Middlefield Rd	28.4	C	30.0	C
9. Ringwood Ave/Middlefield Rd	27.5	C	26.5	C
10. Willow Rd/Middlefield Rd	52.5	D	53.1	D
11. Willow Rd/Gilbert Ave	9.6	A	11.8	B
12. Willow Rd/Coleman Ave	8.9	A	11.0	B
13. Willow Rd/Durham St-VA Hospital	27.0	C	14.8	B
14. Willow Rd/Bay Rd	32.2	C	13.5	B
15. Willow Rd/US 101 S Ramps	**74.1**	**E**	17.9	B
16. Willow Rd/US 101 N Ramps	27.6	C	34.8	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; **Bold** text = deficient operation

Near-Term Conditions

Near-Term operating conditions were determined with traffic for 35 pending, approved, and under construction projects added to the existing volumes. The list of projects provided by City staff include the following.

- 301-309 Constitution Drive: 962,400 square feet (SF) of offices and 200-room hotel
- 500 El Camino Real: 215-unit apartments, 142,840 SF offices, 10,286 SF retail
- 1300 El Camino Real: 183 apartments, 199,054 SF offices, 25,049 SF retail
- 1021 Evelyn Street: Three residences and 6,610 SF offices
- 2111-2121 Sand Hill Road: 39,010 SF offices
- 115 El Camino Real: Four residences and 1,543 SF retail to replace 13-room hotel
- 409 Glenwood Avenue: Seven residences to replace two residences
- 1350 Adams Court: 260,400 SF of research and development (R&D) space

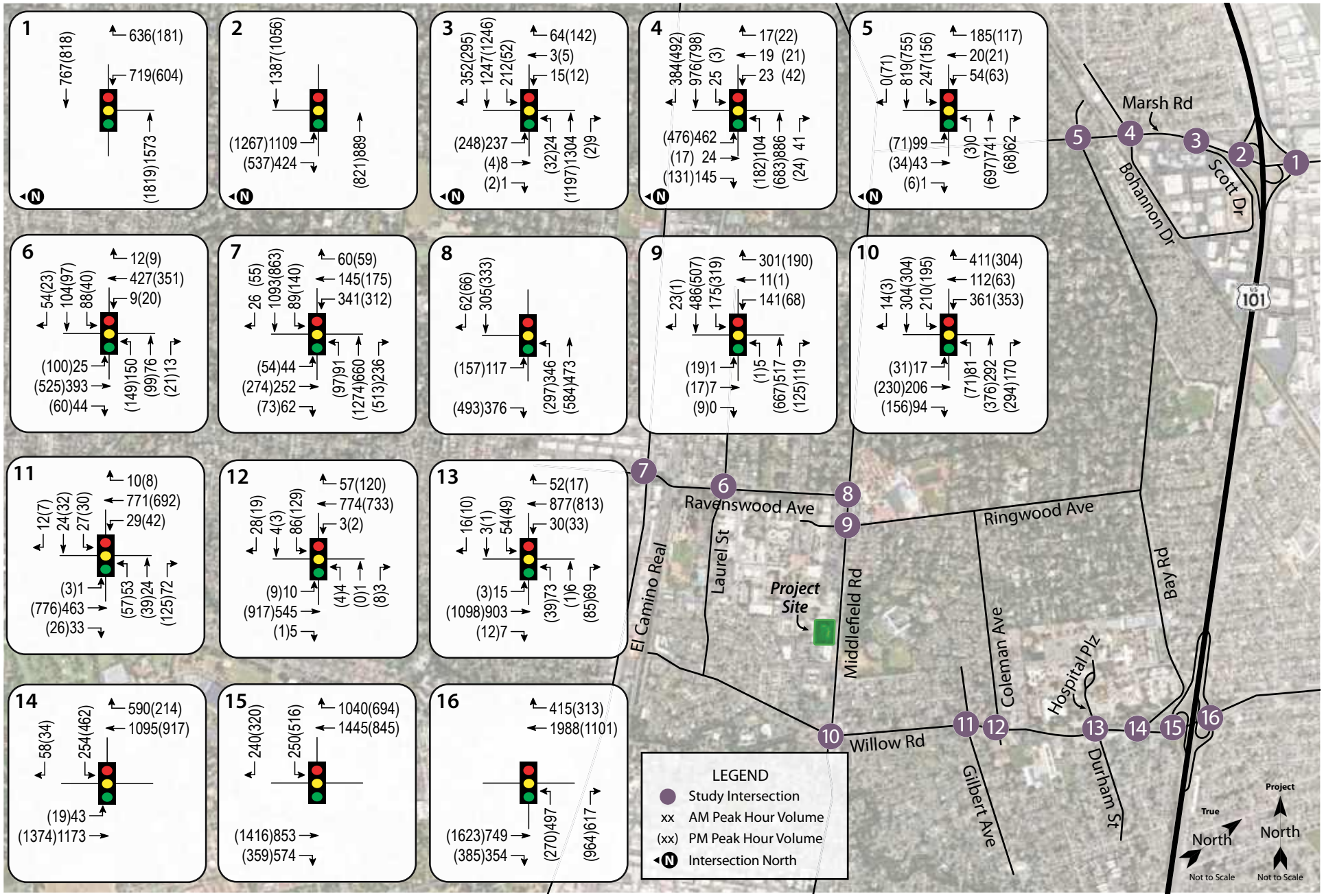

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Figure 3 – Existing Traffic Volumes

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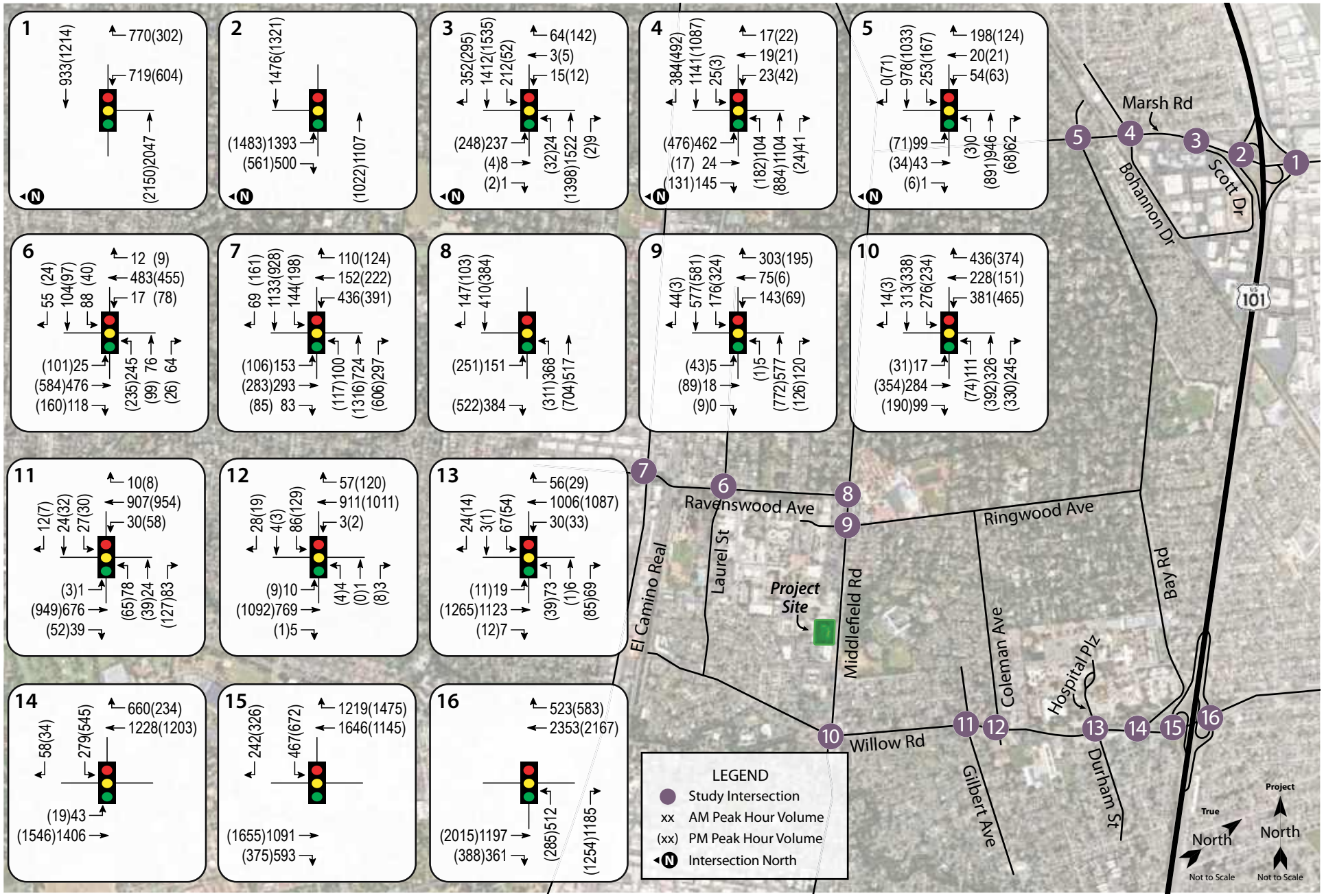
- 1350 Willow Road: 1,730 multifamily units, 1,600,000 SF offices, 200,000 commercial retail, and 193 hotel rooms to replace existing offices, warehouses, and laboratories
- 111 Independence Drive: 105 residential units and 746 SF retail to replace 15,000 SF offices
- 1125 O'Brien Drive: 128,525 SF R&D and 2,760 SF retail to replace 59,643 SF offices and warehousing
- 162-164 Jefferson Drive: 249,500 SF offices
- 716 Santa Cruz Avenue: Four residences, 23,454 SF offices, and 12,035 SF retail to replace 15,175 SF retail
- 201 El Camino Real/612 Cambridge Avenue: 14 multifamily units, 5,876 SF retail, 1,200 SF restaurant to replace four residential units and 5,949 SF retail
- 1162 El Camino Real: Nine residences to replace 11,062 SF offices/retail
- 3723 Haven Avenue: 163-room hotel to replace 13,700 SF offices/warehouse
- 110 Constitution Drive/115 Independence Drive: 335 apartment units, 34,819 SF offices, and 1,608 SF retail to replace 64,832 SF offices and industrial
- 1075 O'Brien Drive/20 Kelly Court: 166,190 SF R&D and 9,869 SF restaurant to replace 14,523 SF warehouse and 12,192 SF R&D
- 1550 El Camino Real: Eight residences
- 165 Jefferson Drive: 158 apartment units and 15,000 SF retail to replace 24,300 SF offices
- 123 Independence Drive: 432 dwelling units to replace 108,461 SF warehouse/manufacturing
- 333 Ravenswood Avenue: 800 residential units and 1,095,719 SF offices and commercial to replace 1,095,719 SF R&D
- 995-1005 O'Brien Drive/1320 Willow Road: 228,398 SF R&D to replace 40,586 SF R&D and 50,045 SF commercial and warehousing
- 2245 Avy Avenue: 15,011 SF recreational and educational space
- 1220 Hoover Street: Eight residential units to replace two units
- 3705 Haven: 112 dwelling units to replace 10,362 SF offices
- 1030 O'Brien: 61,901 SF R&D and 5,787 SF retail to replace 38,040 SF offices
- 795 Willow: 62 residential units
- 985 Santa Cruz Avenue: Seven apartment units to replace two residences
- 320 Sheridan Drive: 88-unit apartments
- 104 Constitution: 140 residential units
- 888 El Camino Real: 41 apartments to replace 4,580 SF restaurant
- 60 Willow Road: 50 dwelling units to replace 23,186 SF offices
- 300 Middlefield: Fire station and administration building replacement
- 335 Pierce Road: Eight dwelling units

Under the near-term conditions, Willow Road/Bay Road would operate unacceptably during the a.m. peak hour, Ravenswood Avenue/Laurel Street and Willow Road/US 101 North Ramps would have deficient operations during the evening peak hour, and Willow Road/Middlefield Road and Willow Road/US 101 South Ramps would operate ant an unacceptable LOS E or F during both peak hours. The other intersections would have acceptable operations. These results are summarized in Table 8, and Near-Term volumes are shown in Figure 4.



Transportation Impact Study for the 333 Middlefield Road Project

Figure 4 – Near-Term Traffic Volumes

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Table 8 – Near-Term Peak Hour Intersection Levels of Service				
Study Intersection	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. Marsh Rd/US 101 N Off-Ramp	22.6	C	21.7	C
2. Marsh Rd/US 101 S Off-Ramp	43.4	D	24.6	C
3. Marsh Rd/Scott Dr	19.1	B	20.4	C
4. Marsh Rd/Florence St-Bohannon Dr	30.9	C	30.7	C
5. Marsh Rd/Bay Rd	19.3	B	20.6	C
6. Ravenswood Ave/Laurel St	46.2	D	**63.5**	**E**
7. Ravenswood Ave/El Camino Real	46.7	D	37.5	D
8. Ravenswood Ave/Middlefield Rd	34.6	C	31.3	C
9. Ringwood Ave/Middlefield Rd	27.5	C	27.7	C
10. Willow Rd/Middlefield Rd	**58.1**	**E**	**56.5**	**E**
11. Willow Rd/Gilbert Ave	10.6	B	17.2	B
12. Willow Rd/Coleman Ave	9.0	A	14.4	B
13. Willow Rd/Durham St-VA Hospital	39.9	D	18.4	B
14. Willow Rd/Bay Rd	**68.0**	**E**	19.0	B
15. Willow Rd/US 101 S Ramps	**119.2**	**F**	**63.8**	**E**
16. Willow Rd/US 101 N Ramps	44.1	D	**	**F**

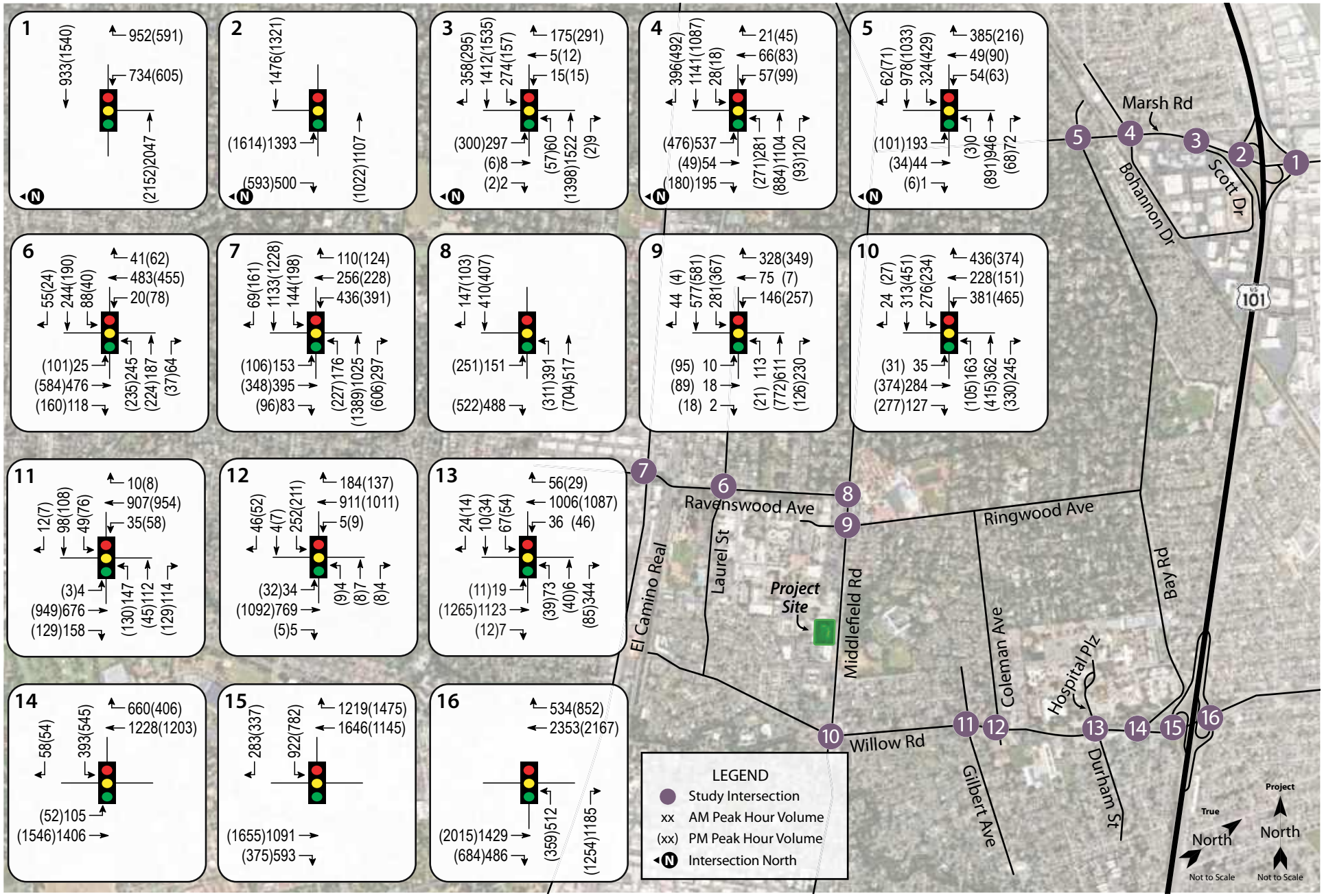
Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; ** = delay greater than 120 seconds; **Bold** text = deficient operation

Cumulative Conditions

The Cumulative volume scenario was developed using the City's Vistro traffic model. Where the resulting cumulative volumes were forecast to be lower than the Near-Term volumes developed for this study, the Near-Term volumes were used so as not to show a reduction in future year traffic. A review of the cumulative volumes used in the *Parkline Transportation Impact Analysis*, Hexagon Transportation Consultants, Inc., July 2024, as well as the volumes that would result from a forecast derived from the City's travel demand model, was also undertaken to ensure relative consistency between data sources and to verify the volumes as appropriate for use in this analysis.

There are no capacity-enhancing infrastructure improvements planned in the study area, such as additional roadway lanes or changes to intersection controls, so the Cumulative analysis was conducted using the same intersection capacities as for the Near-Term and Existing volume scenarios.

Under the Cumulative conditions, Marsh Road/Florence Street-Bohannon Drive, Ravenswood Avenue/Laurel Street, Willow Road/Middlefield Road, Willow Road/US 101 South Ramps, and Willow Road/US 101 North Ramps would operate unacceptably during both peak hours. Additionally, there would be deficient operation during the a.m. peak hour at Ravenswood Avenue/El Camino Real, Willow Road/Durham Street-VA Hospital, and Willow Road/Bay Road, as well as deficient operation during the p.m. peak hour at Marsh Road/Bay Road. Otherwise, the intersections would have acceptable operations. These results are summarized in Table 9, and Cumulative volumes are shown in Figure 5.



Transportation Impact Study for the 333 Middlefield Road Project

Figure 5 – Cumulative Traffic Volumes

Table 9 – Cumulative Peak Hour Intersection Levels of Service				
Study Intersection	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. Marsh Rd/US 101 N Off-Ramp	34.6	C	23.4	C
2. Marsh Rd/US 101 S Off-Ramp	43.3	D	26.2	C
3. Marsh Rd/Scott Dr	31.3	C	30.9	C
4. Marsh Rd/Florence St-Bohannon Dr	**70.9**	**E**	**47.3**	**D**
5. Marsh Rd/Bay Rd	33.5	C	**50.2**	**D**
6. Ravenswood Ave/Laurel St	**56.5**	**E**	**67.7**	**E**
7. Ravenswood Ave/El Camino Real	**61.9**	**E**	47.0	D
8. Ravenswood Ave/Middlefield Rd	37.0	D	31.5	C
9. Ringwood Ave/Middlefield Rd	53.0	D	39.5	D
10. Willow Rd/Middlefield Rd	**59.0**	**E**	**61.1**	**E**
11. Willow Rd/Gilbert Ave	17.2	B	29.8	C
12. Willow Rd/Coleman Ave	25.7	C	28.8	C
13. Willow Rd/Durham St-VA Hospital	**114.1**	**F**	23.5	C
14. Willow Rd/Bay Rd	**	**F**	20.4	C
15. Willow Rd/US 101 S Ramps	**	**F**	**73.9**	**E**
16. Willow Rd/US 101 N Ramps	**88.0**	**F**	**	**F**

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; ** = delay greater than 120 seconds; **Bold** text = deficient operation

Project Conditions

Near-Term plus Project Conditions

Upon the addition of project-generated traffic to the Near-Term volumes, the study intersections are expected to operate at the same levels of service as without the proposed project. These results are summarized in Table 10. Project traffic volumes are shown in Figure 6 and Near-Term plus Project volumes are provided in Figure 7.

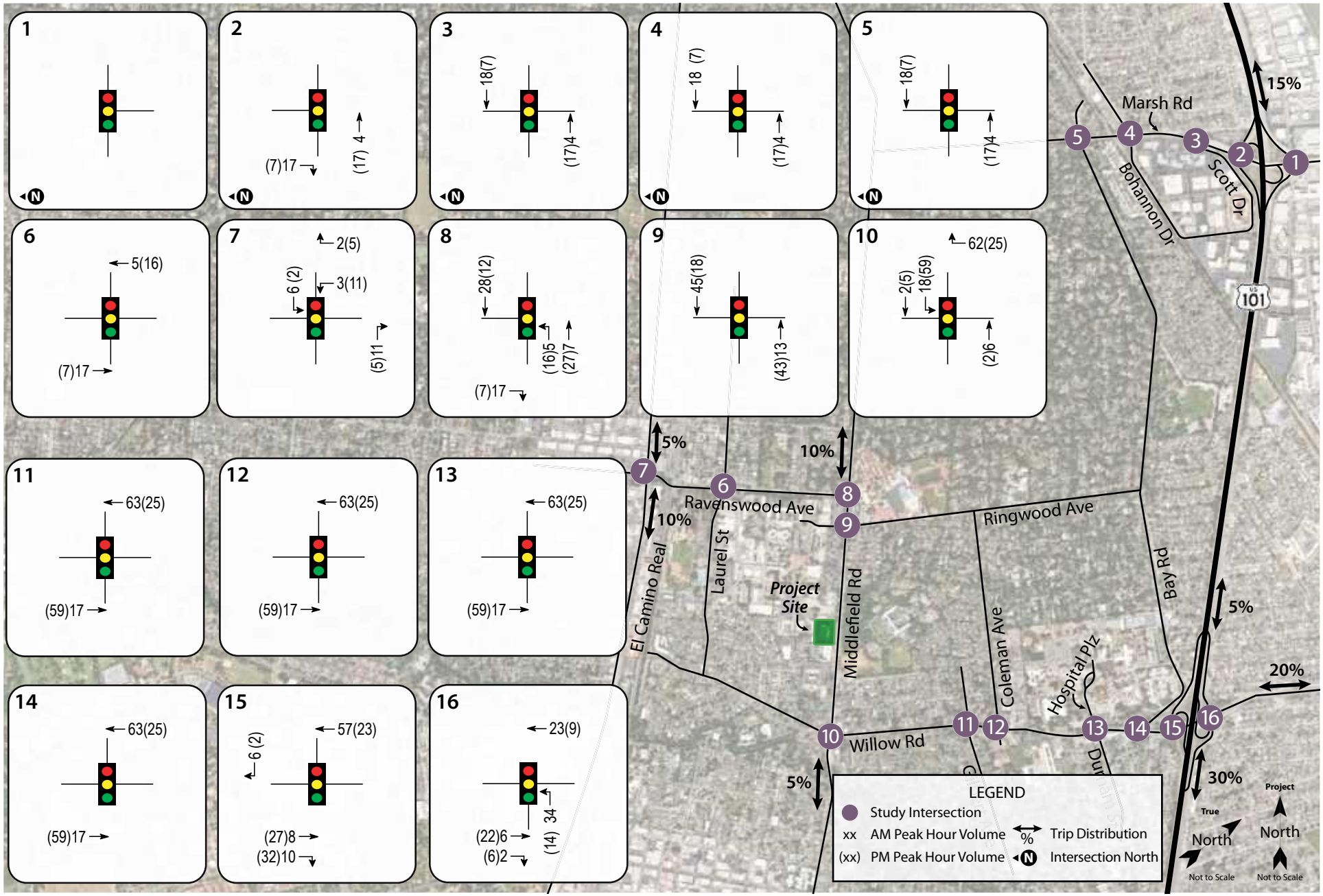


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Figure 6 – Project Traffic Volumes and Trip Distribution

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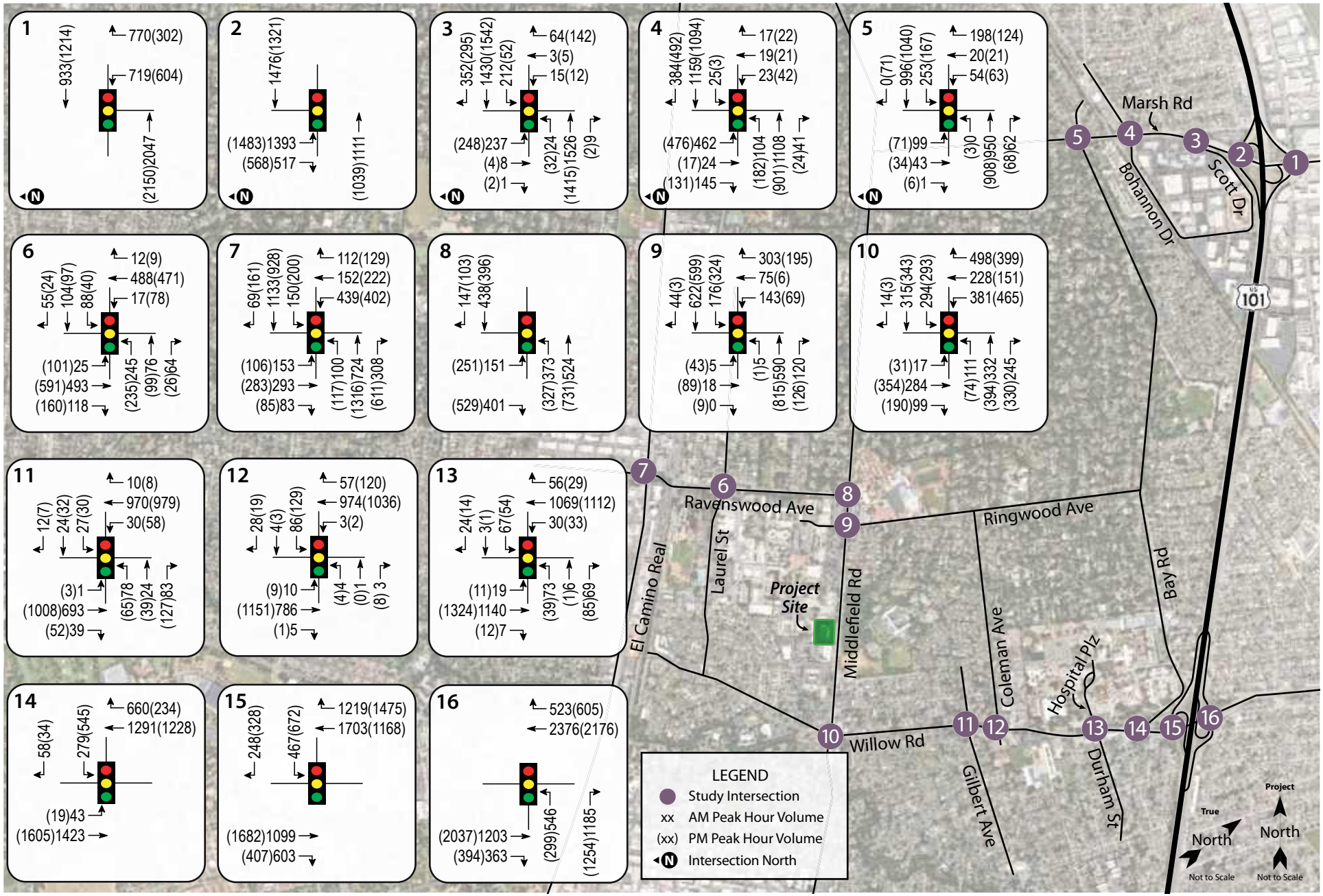

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Figure 7 – Near-Term plus Project Traffic Volumes

Table 10 – Near-Term and Near-Term plus Project Peak Hour Intersection Levels of Service

Study Intersection	Near-Term Conditions				Near-Term plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Marsh Rd/US 101 N Off-Ramp	22.6	C	21.7	C	22.6	C	21.7	C
2. Marsh Rd/US 101 S Off-Ramp	43.4	D	24.6	C	43.9	D	24.8	C
3. Marsh Rd/Scott Dr	19.1	B	20.4	C	19.1	B	20.4	C
4. Marsh Rd/Florence St-Bohannon Dr	30.9	C	30.7	C	31.1	C	30.8	C
5. Marsh Rd/Bay Rd	19.3	B	20.6	C	19.3	B	20.6	C
6. Ravenswood Ave/Laurel St	46.2	D	**63.5**	**E**	46.5	D	**64.7**	**E**
7. Ravenswood Ave/El Camino Real	46.7	D	37.5	D	46.8	D	37.9	D
8. Ravenswood Ave/Middlefield Rd	34.6	C	31.3	C	37.1	D	31.9	C
9. Ringwood Ave/Middlefield Rd	27.5	C	27.7	C	27.1	C	27.6	C
10. Willow Rd/Middlefield Rd	**58.1**	**E**	**56.5**	**E**	**59.2**	**E**	**57.9**	**E**
11. Willow Rd/Gilbert Ave	10.6	B	17.2	B	11.0	B	19.6	B
12. Willow Rd/Coleman Ave	9.0	A	14.4	B	9.3	A	15.6	B
13. Willow Rd/Durham St-VA Hospital	39.9	D	18.4	B	49.0	D	19.0	B
14. Willow Rd/Bay Rd	**68.0**	**E**	19.0	B	**76.4**	**E**	19.7	B
15. Willow Rd/US 101 S Ramps	**119.2**	**F**	**63.8**	**E**	**117.7**	**F**	**63.3**	**E**
16. Willow Rd/US 101 N Ramps	44.1	D	**	**F**	44.5	D	**	**F**

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; ** = delay greater than 120 seconds; **Bold** text = deficient operation

The proposed project would not result in an intersection operating acceptably to degrade to a deficient LOS with the addition of project-generated traffic. For all intersections operating acceptably without or with the project, the addition of traffic associated with the project would result in an increase to the average delay of less than 23 seconds. Therefore, the proposed project would not result in an operational deficiency per these two conditions of the City's LOS standard. For intersections that would operate at an unacceptable LOS without the project, a project deficiency would occur if it would increase the critical movement delay by more than 0.8 seconds. Table 11 shows the calculated critical movement delay for intersections that would operate deficiently without the project and the critical movement delay with project traffic added.

Table 11 – Near-Term and Near-Term plus Project Peak Hour Intersection Critical Movement Delay

Study Intersection	Near-Term Conditions				Near-Term plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
6. Ravenswood Ave/Laurel St	-	-	82.9	F	-	-	85.6	F
10. Willow Rd/Middlefield Rd	82.1	F	70.7	E	82.1	F	70.7	E
14. Willow Rd/Bay Rd	156.0	F	-	-	156.0	F	-	-
15. Willow Rd/US 101 S Ramps	428.2	F	169.6	F	428.3	F	169.6	F
16. Willow Rd/US 101 N Ramps	-	-	706.0	F	-	-	706.0	F

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; - = Intersection would operate acceptably overall so critical movement delay was not evaluated

In most cases, the addition of project-generated traffic would not affect the critical movement delay as the movement with the critical delay is often not one that the project would add traffic to. For example, the critical movement for Willow Road/US 101 South Ramps is the on-ramp from Willow Road westbound to US 101 South, which would not carry project traffic. For Ravenswood Avenue/Laurel Street, however, the critical movement would be the eastbound through trips on Ravenswood Avenue which the proposed project would contribute additional traffic to, increasing the critical movement delay from 82.9 seconds without the project to 85.6 seconds with the project. As this would represent an increase greater than 0.8 seconds, a project deficiency may occur. However, this deficiency would be alleviated through retiming the traffic signal to adjust to the shifts in traffic patterns associated with adding traffic for the 35 Near-Term pending, approved, and under construction projects, improving the overall intersection operation to 54.5 seconds of delay (LOS D). As traffic signals are routinely retimed, and could be assumed to be adjusted in response to one of the Near-term projects, this would not be considered a deficiency specific to the proposed project.

Finding – The study intersections would operate at the same levels of service with the addition of project-generated traffic as they would without the project. The addition of project traffic would increase the delay at intersections operating acceptably by less than 23 seconds, and the critical movement delay for intersections operating deficiently by less than 0.8 seconds except at Ravenswood Avenue/Laurel Street for the p.m. peak hour. However, because this increase would be resolved by routine traffic signal retiming, it would not be considered an adverse effect of the proposed project.

Cumulative plus Project Conditions

With project-related traffic added to Cumulative volumes, the study intersections are expected to operate at the same levels of service, except Willow Road/Gilbert Avenue which would decrease from LOS C to LOS D for the p.m. peak hour, retaining acceptable operation. These results are summarized in Table 12 and Cumulative plus Project volumes are shown in Figure 8.

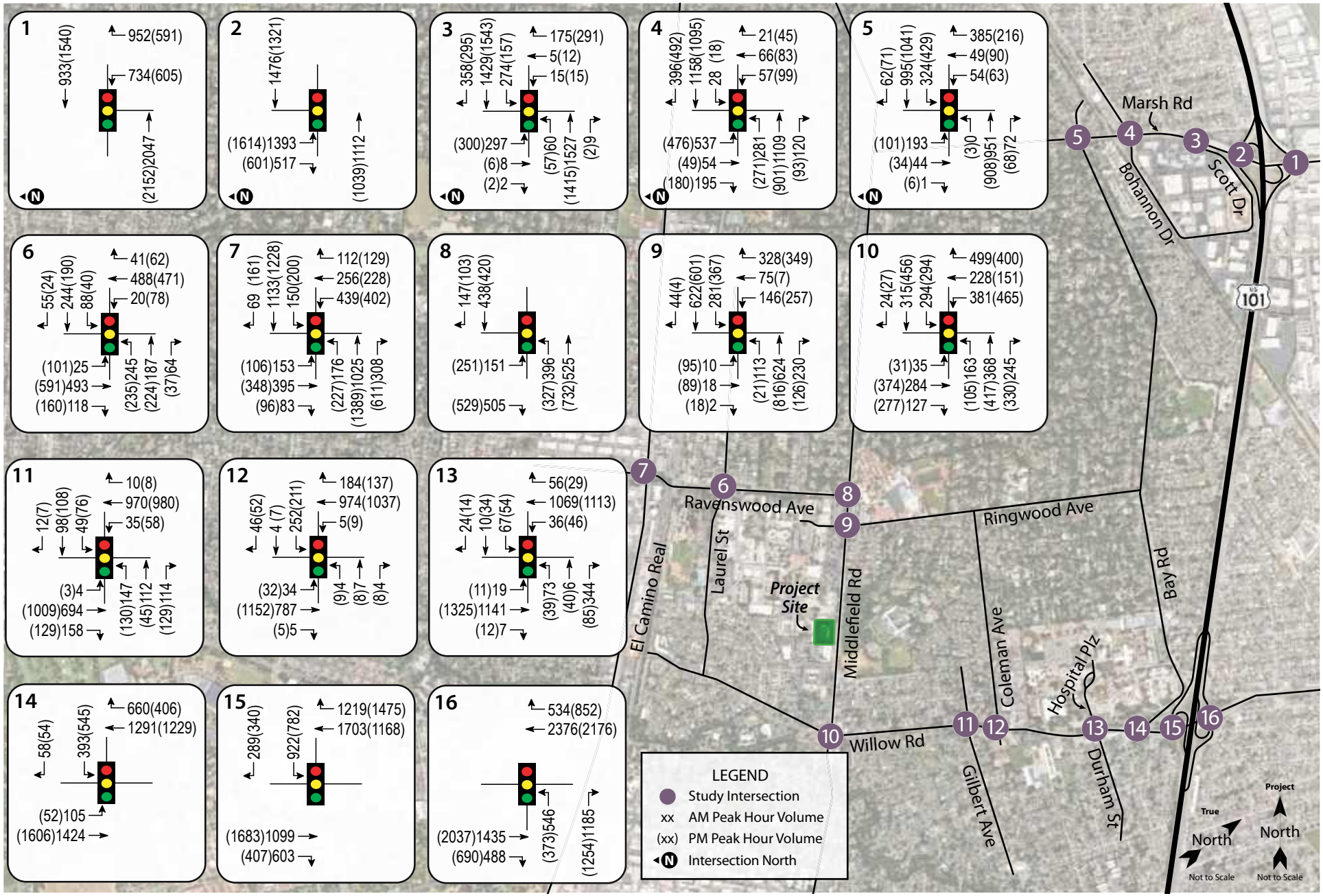

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Figure 8 – Cumulative plus Project Traffic Volumes

Table 12 – Cumulative and Cumulative plus Project Peak Hour Intersection Levels of Service

Study Intersection	Cumulative Conditions				Cumulative plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Marsh Rd/US 101 N Off-Ramp	34.6	C	23.4	C	34.6	C	23.4	C
2. Marsh Rd/US 101 S Off-Ramp	43.3	D	26.2	C	43.9	D	26.2	C
3. Marsh Rd/Scott Dr	31.3	C	30.9	C	31.4	C	31.0	C
4. Marsh Rd/Florence St-Bohannon Dr	**70.9**	**E**	**47.3**	**D**	**70.9**	**E**	**47.5**	**D**
5. Marsh Rd/Bay Rd	33.5	C	**50.2**	**D**	33.6	C	**50.1**	**D**
6. Ravenswood Ave/Laurel St	**56.5**	**E**	**67.7**	**E**	**56.2**	**E**	**68.8**	**E**
7. Ravenswood Ave/El Camino Real	**61.9**	**E**	47.0	D	**61.9**	**E**	47.5	D
8. Ravenswood Ave/Middlefield Rd	37.0	D	31.5	C	41.1	D	32.1	C
9. Ringwood Ave/Middlefield Rd	53.0	D	39.5	D	52.2	D	39.4	D
10. Willow Rd/Middlefield Rd	**59.0**	**E**	**61.1**	**E**	**60.2**	**E**	**63.5**	**E**
11. Willow Rd/Gilbert Ave	17.2	B	29.8	C	17.9	B	35.9	D
12. Willow Rd/Coleman Ave	25.7	C	28.8	C	27.8	C	32.1	C
13. Willow Rd/Durham St-VA Hospital	**114.1**	**F**	23.5	C	**125.4**	**F**	24.4	C
14. Willow Rd/Bay Rd	**133.5**	**F**	20.4	C	**144.6**	**F**	21.0	C
15. Willow Rd/US 101 S Ramps	**138.5**	**F**	**73.9**	**E**	**136.8**	**F**	**73.2**	**E**
16. Willow Rd/US 101 N Ramps	**88.0**	**F**	**185.1**	**F**	**90.3**	**F**	**185.8**	**F**

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; ** = delay greater than 120 seconds; **Bold** text = deficient operation

Similar to under Near-Term volumes, the addition of project traffic to Cumulative volumes would not degrade an intersection operating acceptably to a deficient LOS or increase its average delay by more than 23 seconds. For intersections that would operate deficiently without the project, the effect of project traffic on the critical movement delay is outlined in Table 13.

Table 13 – Cumulative and Cumulative plus Project Peak Hour Intersection Critical Movement Delay

Study Intersection	Cumulative Conditions				Cumulative plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
4. Marsh Rd/Florence St-Bohannon Dr	532.9	F	109.2	F	532.9	F	109.2	F
5. Marsh Rd/Bay Rd	-	-	170.8	F	-	-	170.8	F
6. Ravenswood Ave/Laurel St	92.0	F	87.6	F	92.0	F	90.3	F
7. Ravenswood Ave/El Camino Real	192.4	F	-	-	192.4	F	-	-
10. Willow Rd/Middlefield Rd	80.9	F	71.1	E	80.9	F	72.3	E
13. Willow Rd/Durham St-VA Hospital	391.35	F	-	-	391.4	F	-	-
14. Willow Rd/Bay Rd	268.0	F	-	-	268.0	F	-	-
15. Willow Rd/US 101 S Ramps	484.3	F	170.9	F	484.3	F	170.9	F
16. Willow Rd/US 101 N Ramps	168.8	F	706.0	F	168.8	F	706.0	F

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; - = Intersection would operate acceptably overall so critical movement delay was not evaluated

The addition of project traffic would not affect the critical movement delay in most cases. For Ravenswood Avenue/Laurel Street, the critical movement delay for the p.m. peak hour would increase from 87.6 seconds under Cumulative volumes, to 90.3 seconds with the addition of project-generated traffic. This would be an increase of 2.7 seconds, which is greater than the threshold of 0.8 seconds. Modification of the traffic signal timing would reduce the critical movement delay to 88.2 seconds, for an increase of 0.6 seconds, which would be below the threshold. As discussed under the Near-Term results, traffic signal retiming is a routine maintenance measure that would likely occur in response to shifting traffic patterns over time, and therefore would not represent a project deficiency.

For Willow Road/Middlefield Road, the critical movement delay of 71.1 seconds would increase to 72.3 seconds with the project, an increase of 1.2 seconds which exceeds the threshold of 0.8 seconds. Routine traffic signal retiming would reduce the critical movement delay to 71.5 seconds. As this would be an increase of only 0.4 seconds, it would not represent a deficiency of the project.

Finding – The study intersections are expected to continue operating at the same levels of service upon the addition of project-generated traffic. The intersections that would operate acceptably under Cumulative volumes would have increases to delay below the 23-second threshold with project traffic added. For intersections operating efficiently without the project, the addition of project traffic would increase the critical movement delays by less than the threshold of 0.8 seconds assuming routine signal retiming would be conducted at Ravenswood Avenue/Laurel Street and Willow Road/Middlefield Road.

Parking

The proposed project was analyzed to determine whether the proposed parking supply would be sufficient for the anticipated parking demand. The project site as proposed would include retaining the existing 161 total parking spaces.

Jurisdiction parking supply requirements are based on the City of Menlo Park Municipal Code, Chapter 16.72; Off-Street Parking, which requires one space per 200 square feet of office space, which also covers medical office buildings. Parking demand was also estimated using standard rates published by ITE in *Parking Generation*, 6th Edition, 2025, for the "Medical-Dental Office" (ITE LU #720) and "General Office Building" (ITE LU #710) uses. The proposed parking supply, expected demand, and City requirements are shown in Table 14.

Table 14 – Parking Analysis Summary

Land Use	Units	Supply (spaces)	City Requirements		ITE Parking Generation	
			Rate	Spaces Required	Rate	Est. Parking Demand
General Office Building	43.559 ksf	161	1 per 200 sf	218	1.95 per ksf	85
Medical Office Building	43.559 ksf	161	1 per 200 sf	218	2.63 per ksf	115

Note: ksf = 1,000 square feet

While the existing office building has fewer parking spaces (161 stalls) than required by code (218 stalls), it contains more spaces than are estimated to be actually needed per ITE rates (85 stalls). For the proposed use, the City's requirement would remain at 218 parking spaces but the estimated demand would increase to 115 spaces. While the existing and proposed use both would have a higher parking requirement than the proposed supply, the estimated demand would be lower than the parking supply. Therefore, there is minimal likelihood of parking intrusion into nearby residential areas or other businesses. For the applicant-specific project parking demand, with up to 125 staff and 10 patients on-site as a maximum, it would be unlikely that the parking demand would exceed 135 stalls. Therefore, the 161 existing stalls proposed to remain would be adequate for the proposed project. The project applicant should work with City staff to secure a use permit or otherwise confirm approval would be granted for the parking shortfall.

The site plan shows that out of the 161 spaces provided, there are seven accessible stalls with one stall being van accessible. Requirements stipulated by the *Guidance on the 2010 ADA Standards for Accessible Design*, Department of Justice, 2010, prescribes a minimum of six accessible parking spaces for lots of 151 to 200 total spaces, and that at least one of every six accessible parking spaces shall be van accessible. While the seven existing and proposed stalls are therefore sufficient to meet this requirement, two van-accessible spaces are required to be designated. One is designated on the site plan whereas two are designated in the existing parking lot and are proposed to remain as is. Therefore, the site plan should be updated to reflect this existing condition as being proposed to remain to ensure ADA compliance.

Finding – The proposed parking supply for the medical office building use would be short of the City's requirement but exceed the anticipated demand. There would be sufficient accessible parking per ADA requirements, but only one van-accessible space is denoted on the site plan where two are required.

Recommendation – The applicant should work with City staff to secure a use permit for the proposed parking shortfall compared to the City's requirement. The site plan should be updated to reflect the second existing van-accessible space as being proposed to remain.

Conclusions and Recommendations

Conclusions

- Using standard ITE rates for a medical office building, the project would generate a daily average of 1,482 trips, including 140 a.m. and 149 p.m. peak hour trips. Using project-specific data provided by the applicant, the estimated trip generation would result in 429 trips per day on average, with 91 trips occurring during the morning peak hour and 47 trips during the evening peak hour.
- The project would not conflict with adopted plans and policies regarding pedestrian, bicycle, or transit facilities.
- As the project would have travel characteristics substantially similar to a local-serving retail use, it would be presumed to have a less-than-significant impact on VMT.
- The project's effect on safety would be negligible as there is adequate sight distance at the site driveways, turn lanes effectively already exist, and the potential for cut-through traffic is negligible.
- As the project would be required to secure approval from the fire code official as part of the permitting process, and emergency vehicles can use lights, sires, and signal preemption equipment to bypass traffic, the project would immaterially affect emergency access.
- The addition of project traffic to Near-Term or Cumulative volumes would not result in a project-specific deficiency. The critical movement delay would increase by more than the threshold of 0.8 seconds for Ravenswood Avenue/Laurel Street during the p.m. peak hour under Near-Term plus Project and Cumulative plus Project volumes, and for Willow Road/Middlefield Road during the p.m. peak hour under Cumulative plus Project volumes. However, because these increases would be resolved by routine signal retiming, they would not be considered adverse effects of the project.
- The proposed parking supply of 161 spaces for the project would be inadequate to satisfy the requirements of the City of Menlo Park for 218 spaces, but would exceed the anticipated demand of 115 spaces, resulting in a negligible likelihood of project parking demand intruding into nearby neighborhoods. Seven accessible parking spaces would be provided, exceeding the ADA requirement for six such spaces. However, only one is identified as being van accessible whereas two such spaces are required when there are seven accessible spaces.

Recommendations

- The applicant should work with City staff to secure approval for the parking shortfall of 161 proposed spaces compared to the City's code requirement for 218 parking spaces.
- The second existing van-accessible parking space should be shown on the site plan as being proposed to remain.

Study Participants and References

Study Participants

Principal in Charge	Mark E. Spencer, PE (Traffic)
Senior Traffic Engineer	Kevin Carstens, PE (Civil, Traffic)
Associate Engineer	Cade Luongo, EIT
Assistant Engineer	Rory Meechan, EIT
Graphics	Erika Totanes
Editing/Formatting	Erika Totanes
Quality Control	Mark E. Spencer, PE (Traffic)

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Appendix A

Intersection Level of Service Calculations

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333 Middlefield Road TIA

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Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road and US 101 NB Ramps	Signalized	HCM 7th Edition	WB Right	0.749	17.2	B
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	EB Right	0.803	20.2	C
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	NB Left	0.660	18.9	B
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	SB Left	0.649	30.7	C
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	SB Left	0.580	18.4	B
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	NB Left	0.462	38.9	D
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	EB Right	0.629	36.0	D
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	NB Left	0.661	28.4	C
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	NB Left	0.504	27.5	C
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	NB Right	0.626	52.5	D
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	SB Left	0.534	9.6	A
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.569	8.9	A
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	EB Left	0.798	27.0	C
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	WB Right	0.982	32.2	C
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	1.583	74.1	E
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	WB Thru	0.982	27.6	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road and US 101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	17.2
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.749

Intersection Setup

Name	Marsh Road		Marsh Road		US 101 NB Off-Ramp	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

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Volumes

Name	Marsh Road		Marsh Road		US 101 NB Off-Ramp	
Base Volume Input [veh/h]	1573	0	0	767	719	636
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1573	0	0	767	719	636
Peak Hour Factor	0.9670	1.0000	1.0000	0.9670	0.9670	0.9670
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	407	0	0	198	186	164
Total Analysis Volume [veh/h]	1627	0	0	793	744	658
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	1		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	2		0		1	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	1		1		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	60	0	0	60	60	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	30	0	0	30	60	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	No	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	61	61	24	24
g / C, Green / Cycle	0.68	0.68	0.27	0.27
(v / s)_i Volume / Saturation Flow Rate	0.46	0.22	0.22	0.23
s, saturation flow rate [veh/h]	3560	3560	3459	2813
c, Capacity [veh/h]	2420	2420	935	760
d1, Uniform Delay [s]	8.50	5.94	30.53	31.28
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.51	0.36	0.60	1.19
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.67	0.33	0.80	0.87
d, Delay for Lane Group [s/veh]	10.01	6.30	31.13	32.47
Lane Group LOS	B	A	C	C
Critical Lane Group	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	8.17	2.73	7.36	6.73
50th-Percentile Queue Length [ft/ln]	204.16	68.24	184.05	168.15
95th-Percentile Queue Length [veh/ln]	12.85	4.91	11.81	10.98
95th-Percentile Queue Length [ft/ln]	321.32	122.83	295.29	274.49

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	10.01	0.00	0.00	6.30	31.13	32.47
Movement LOS	B			A	C	C
d_A, Approach Delay [s/veh]	10.01		6.30		31.76	
Approach LOS	B		A		C	
d_I, Intersection Delay [s/veh]	17.22					
Intersection LOS	B					
Intersection V/C	0.749					

Emissions

Vehicle Miles Traveled [mph]	38.47	18.75	17.64	15.60
Stops [stops/h]	653.31	218.37	588.95	538.09
Fuel consumption [US gal/h]	8.51	3.00	8.69	7.96
CO [g/h]	594.73	209.37	607.61	556.60
NOx [g/h]	115.71	40.74	118.22	108.29
VOC [g/h]	137.83	48.52	140.82	129.00

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	36.45	34.67
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.883	2.472
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	564	564	1240
d_b, Bicycle Delay [s]	23.20	23.20	6.50
l_b,int, Bicycle LOS Score for Intersection	2.902	2.214	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	20.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.803

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	889	1387	217	1109	424
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	889	1387	217	1109	424
Peak Hour Factor	1.0000	0.9590	0.9590	1.0000	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	232	362	54	289	111
Total Analysis Volume [veh/h]	0	927	1446	217	1156	442
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1		0		2	
v_di, Inbound Pedestrian Volume crossing m	2		0		1	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	2		1		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	60	60	0	35	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	10	0	5	0
Pedestrian Clearance [s]	0	16	0	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	55	55	0	35	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	53	51	33	33
g / C, Green / Cycle	0.59	0.56	0.36	0.36
(v / s)_i Volume / Saturation Flow Rate	0.23	0.41	0.33	0.28
s, saturation flow rate [veh/h]	4000	3560	3459	1586
c, Capacity [veh/h]	2341	2001	1261	578
d1, Uniform Delay [s]	10.07	14.54	27.28	25.16
k, delay calibration	0.50	0.50	0.04	0.24
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.50	2.30	1.21	4.63
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.40	0.72	0.92	0.76
d, Delay for Lane Group [s/veh]	10.58	16.84	28.49	29.79
Lane Group LOS	B	B	C	C
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	4.54	10.18	11.50	8.70
50th-Percentile Queue Length [ft/ln]	113.51	254.55	287.48	217.60
95th-Percentile Queue Length [veh/ln]	8.03	15.42	17.06	13.54
95th-Percentile Queue Length [ft/ln]	200.87	385.38	426.52	338.55

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	10.58	16.84	0.00	28.49	29.79
Movement LOS		B	B		C	C
d_A, Approach Delay [s/veh]	10.58		16.84		28.85	
Approach LOS	B		B		C	
d_I, Intersection Delay [s/veh]	20.21					
Intersection LOS	C					
Intersection V/C	0.803					

Emissions

Vehicle Miles Traveled [mph]	21.96	34.27	27.34	10.45
Stops [stops/h]	363.23	814.56	919.94	348.15
Fuel consumption [US gal/h]	5.56	12.39	12.91	5.03
CO [g/h]	388.95	865.97	902.47	351.83
NOx [g/h]	75.68	168.49	175.59	68.45
VOC [g/h]	90.14	200.70	209.16	81.54

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.45	0.00	32.09
l_p,int, Pedestrian LOS Score for Intersectio	2.933	0.000	2.517
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1120	1120	687
d_b, Bicycle Delay [s]	8.72	8.72	19.40
l_b,int, Bicycle LOS Score for Intersection	2.324	2.753	1.560
Bicycle LOS	B	C	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	18.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.660

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	1	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Base Volume Input [veh/h]	24	1304	9	212	1247	352	237	8	1	15	3	64
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	24	1304	9	212	1247	352	237	8	1	15	3	64
Peak Hour Factor	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	342	2	56	327	92	62	2	0	4	1	17
Total Analysis Volume [veh/h]	25	1367	9	222	1307	369	248	8	1	16	3	67
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			0			1			0		
v_di, Inbound Pedestrian Volume crossing m	1			0			2			0		
v_co, Outbound Pedestrian Volume crossing	2			0			0			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			0			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	135
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	4	4	8	3	8
Auxiliary Signal Groups												
Maximum Green [s]	15	60	60	20	65	65	40	40	40	0	40	0
Amber [s]	3.0	4.0	4.0	3.0	4.0	4.0	3.2	3.2	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	8	8	8	0	8	0
Pedestrian Clearance [s]	0	21	21	0	21	21	24	24	24	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	85	85	14	79	79	20	20	20	0	16	0
Lead / Lag	Lead	-	-	Lead	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	10	10	4	10	10	4	4	4	0	6	0
Vehicle Extension [s]	2.5	3.5	3.5	2.0	3.5	3.5	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	135	135	135	135	135	135	135	135	135	135
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	4.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	4	92	92	10	100	100	15	15	8	8
g / C, Green / Cycle	0.03	0.68	0.68	0.07	0.74	0.74	0.11	0.11	0.06	0.06
(v / s)_i Volume / Saturation Flow Rate	0.01	0.25	0.25	0.06	0.45	0.48	0.07	0.07	0.01	0.02
s, saturation flow rate [veh/h]	1781	3560	1864	3459	1870	1735	1781	1785	1794	2813
c, Capacity [veh/h]	60	2427	1270	256	1378	1278	198	198	106	167
d1, Uniform Delay [s]	63.93	9.17	9.17	61.84	8.50	9.01	57.50	57.50	60.37	61.19
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.41	0.44	0.84	3.46	2.02	2.61	2.67	2.66	0.59	1.15
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.42	0.37	0.37	0.87	0.61	0.65	0.65	0.65	0.18	0.40
d, Delay for Lane Group [s/veh]	67.34	9.61	10.01	65.30	10.52	11.62	60.17	60.16	60.96	62.34
Lane Group LOS	E	A	B	E	B	B	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.90	5.49	5.88	3.87	11.07	11.76	4.39	4.40	0.64	1.15
50th-Percentile Queue Length [ft/ln]	22.43	137.15	147.10	96.82	276.74	294.12	109.80	109.96	16.10	28.66
95th-Percentile Queue Length [veh/ln]	1.61	9.33	9.86	6.97	16.53	17.39	7.83	7.84	1.16	2.06
95th-Percentile Queue Length [ft/ln]	40.37	233.18	246.55	174.27	413.16	434.75	195.73	195.95	28.97	51.58

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	67.34	9.74	10.01	65.30	10.91	11.62	60.16	60.16	60.16	60.96	60.96	62.34
Movement LOS	E	A	B	E	B	B	E	E	E	E	E	E
d_A, Approach Delay [s/veh]		10.77			17.41			60.16			62.03	
Approach LOS		B			B			E			E	
d_I, Intersection Delay [s/veh]						18.93						
Intersection LOS						B						
Intersection V/C						0.660						

Emissions

Vehicle Miles Traveled [mph]	5.16	186.37	97.56	5.26	19.93	19.78	3.87	3.88	1.29	4.56
Stops [stops/h]	23.92	292.58	156.90	206.54	295.19	313.73	117.12	117.29	17.17	61.14
Fuel consumption [US gal/h]	0.72	11.07	5.86	4.70	4.78	5.09	2.20	2.20	0.36	1.29
CO [g/h]	50.27	773.82	409.71	328.77	334.13	355.61	153.45	153.67	25.14	90.12
NOx [g/h]	9.78	150.56	79.72	63.97	65.01	69.19	29.86	29.90	4.89	17.53
VOC [g/h]	11.65	179.34	94.96	76.20	77.44	82.42	35.56	35.61	5.83	20.89

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.03	56.03	56.95	56.95
l_p,int, Pedestrian LOS Score for Intersectio	3.055	3.194	2.137	2.372
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1185	1096	234	175
d_b, Bicycle Delay [s]	11.20	13.78	52.65	56.22
l_b,int, Bicycle LOS Score for Intersection	2.330	3.125	1.984	1.702
Bicycle LOS	B	C	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	30.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.649

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Base Volume Input [veh/h]	104	886	41	25	976	384	462	24	145	23	19	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	104	886	41	25	976	384	462	24	145	23	19	17
Peak Hour Factor	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	232	11	7	256	101	121	6	38	6	5	4
Total Analysis Volume [veh/h]	109	930	43	26	1024	403	485	25	152	24	20	18
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	12			2			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			12			2		
v_co, Outbound Pedestrian Volume crossing	5			2			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			2			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			0			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	155
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	20	80	80	18	72	72	35	35	35	0	35	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	58	58	15	58	58	37	45	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	155	155	155	155	155	155	155	155	155	155	155
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	13	103	103	5	95	95	28	28	28	11	11
g / C, Green / Cycle	0.08	0.66	0.66	0.03	0.61	0.61	0.18	0.18	0.18	0.07	0.07
(v / s)_i Volume / Saturation Flow Rate	0.06	0.26	0.26	0.01	0.40	0.41	0.14	0.14	0.10	0.01	0.02
s, saturation flow rate [veh/h]	1781	1870	1836	1781	1870	1693	1781	1789	1558	1781	1718
c, Capacity [veh/h]	149	1242	1219	56	1144	1035	326	328	286	124	120
d1, Uniform Delay [s]	69.29	11.86	11.87	73.78	19.35	19.67	60.32	60.31	57.17	68.00	68.60
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.56	0.94	0.96	2.21	2.84	3.35	3.04	3.02	1.14	0.56	1.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.73	0.39	0.40	0.46	0.65	0.66	0.78	0.78	0.53	0.19	0.32
d, Delay for Lane Group [s/veh]	71.84	12.80	12.83	75.99	22.19	23.02	63.36	63.33	58.31	68.55	69.72
Lane Group LOS	E	B	B	E	C	C	E	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.32	7.86	7.75	1.05	17.57	16.67	9.93	9.97	5.55	0.93	1.49
50th-Percentile Queue Length [ft/ln]	108.12	196.41	193.75	26.32	439.13	416.68	248.20	249.15	138.87	23.23	37.27
95th-Percentile Queue Length [veh/ln]	7.74	12.45	12.32	1.89	24.44	23.36	15.10	15.14	9.42	1.67	2.68
95th-Percentile Queue Length [ft/ln]	193.38	311.33	307.89	47.37	610.97	584.06	377.38	378.58	235.50	41.82	67.09

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	71.84	12.81	12.83	75.99	22.42	23.02	63.34	63.33	58.31	68.55	69.72	69.72
Movement LOS	E	B	B	E	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	18.76			23.54			62.19			69.27		
Approach LOS	B			C			E			E		
d_I, Intersection Delay [s/veh]	30.68											
Intersection LOS	C											
Intersection V/C	0.649											

Emissions

Vehicle Miles Traveled [mph]	17.11	76.95	75.77	5.36	152.78	141.67	29.46	29.58	17.59	1.35	2.14
Stops [stops/h]	100.44	182.47	180.00	24.45	407.97	387.11	230.58	231.46	129.02	21.58	34.63
Fuel consumption [US gal/h]	3.00	5.58	5.50	0.79	12.23	11.53	5.49	5.51	3.09	0.48	0.77
CO [g/h]	209.76	390.20	384.64	55.25	855.23	805.76	383.73	385.19	215.96	33.45	53.70
NOx [g/h]	40.81	75.92	74.84	10.75	166.40	156.77	74.66	74.94	42.02	6.51	10.45
VOC [g/h]	48.61	90.43	89.14	12.80	198.21	186.74	88.93	89.27	50.05	7.75	12.45

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	66.89	66.89	66.89	66.89
l_p,int, Pedestrian LOS Score for Intersectio	2.911	3.026	2.399	2.008
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	689	689	529	423
d_b, Bicycle Delay [s]	33.32	33.30	41.92	48.17
l_b,int, Bicycle LOS Score for Intersection	2.452	2.758	2.652	1.662
Bicycle LOS	B	C	B	A

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	18.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.580

Intersection Setup

Name	Marsh Road			Marsh Road			Bay Road			Bay Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Bay Road			Bay Road		
Base Volume Input [veh/h]	0	741	62	247	819	0	99	43	1	54	20	185
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	741	62	247	819	0	99	43	1	54	20	185
Peak Hour Factor	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	196	16	65	216	0	26	11	0	14	5	49
Total Analysis Volume [veh/h]	0	782	65	261	865	0	105	45	1	57	21	195
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			9			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			9		
v_co, Outbound Pedestrian Volume crossing	0			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			4			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	8.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	7	0	7	0	7	0	7	7	7	0	7	0
Pedestrian Clearance [s]	17	0	17	0	17	0	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	56	34	56	22	56	34	34	34	34	0	34	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
I2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	44	44	17	63	63	22	22
g / C, Green / Cycle	0.48	0.48	0.19	0.71	0.71	0.24	0.24
(v / s)_i Volume / Saturation Flow Rate	0.24	0.24	0.15	0.23	0.23	0.14	0.17
s, saturation flow rate [veh/h]	1870	1647	1781	1870	1870	1042	1644
c, Capacity [veh/h]	949	800	333	1321	1321	321	447
d1, Uniform Delay [s]	15.66	15.68	34.85	5.05	5.05	30.59	30.81
k, delay calibration	0.50	0.50	0.11	0.50	0.50	0.23	0.23
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.70	2.20	4.07	0.66	0.66	2.29	2.87
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.47	0.50	0.78	0.33	0.33	0.47	0.61
d, Delay for Lane Group [s/veh]	17.35	17.88	38.92	5.72	5.72	32.87	33.68
Lane Group LOS	B	B	D	A	A	C	C
Critical Lane Group	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.22	5.61	5.64	2.64	2.64	3.14	5.57
50th-Percentile Queue Length [ft/ln]	155.58	140.19	141.05	66.03	66.03	78.60	139.21
95th-Percentile Queue Length [veh/ln]	10.31	9.49	9.54	4.75	4.75	5.66	9.44
95th-Percentile Queue Length [ft/ln]	257.85	237.28	238.44	118.85	118.85	141.49	235.96

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	17.35	17.58	17.88	38.92	5.72	5.72	32.87	32.87	32.87	33.68	33.68	33.68
Movement LOS	B	B	B	D	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	17.60			13.41			32.87			33.68		
Approach LOS	B			B			C			C		
d_I, Intersection Delay [s/veh]	18.43											
Intersection LOS	B											
Intersection V/C	0.580											

Emissions

Vehicle Miles Traveled [mph]	10.63	9.40	40.97	67.89	67.89	11.73	6.48
Stops [stops/h]	248.92	224.31	225.68	105.64	105.64	125.77	222.74
Fuel consumption [US gal/h]	3.86	3.49	5.33	3.89	3.89	2.02	3.37
CO [g/h]	270.09	244.11	372.28	271.58	271.58	141.22	235.45
NOx [g/h]	52.55	47.49	72.43	52.84	52.84	27.48	45.81
VOC [g/h]	62.60	56.57	86.28	62.94	62.94	32.73	54.57

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	28.9
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	20.74
l_p,int, Pedestrian LOS Score for Intersectio	2.715	2.951	1.784	2.008
Crosswalk LOS	B	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	642	1131	651	651
d_b, Bicycle Delay [s]	20.76	8.51	20.47	20.47
l_b,int, Bicycle LOS Score for Intersection	2.258	2.489	1.809	2.010
Bicycle LOS	B	B	A	B

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	38.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.462

Intersection Setup

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	150	76	13	88	104	54	25	393	44	9	427	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	150	76	13	88	104	54	25	393	44	9	427	12
Peak Hour Factor	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	40	20	3	23	28	14	7	105	12	2	114	3
Total Analysis Volume [veh/h]	160	81	14	94	111	58	27	419	47	10	455	13
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			25			16		
v_di, Inbound Pedestrian Volume crossing m	16			25			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			7			6		
v_ci, Inbound Pedestrian Volume crossing mi	7			6			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	19			11			39			21		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	26	30	26	30	26	20	71	71	20	71	71
Amber [s]	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	28	28	28	28	28	28	10	44	44	10	44	44
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	5	4	4	5	5	5
Vehicle Extension [s]	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	Yes		No	Yes	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	149	149	149	149	149	149	149	149
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	0.00	2.70	0.00	2.70
g_i, Effective Green Time [s]	26	26	30	30	79	73	79	71
g / C, Green / Cycle	0.17	0.17	0.20	0.20	0.53	0.49	0.53	0.48
(v / s)_i Volume / Saturation Flow Rate	0.09	0.05	0.05	0.10	0.03	0.26	0.01	0.25
s, saturation flow rate [veh/h]	1781	1788	1781	1692	992	1825	976	1858
c, Capacity [veh/h]	310	311	358	340	432	888	423	884
d1, Uniform Delay [s]	55.94	53.77	50.32	52.96	19.18	26.42	18.98	27.45
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.02	2.52	1.78	5.12	0.28	2.22	0.02	2.27
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.52	0.31	0.26	0.50	0.06	0.52	0.02	0.53
d, Delay for Lane Group [s/veh]	61.96	56.29	52.10	58.08	19.46	28.64	19.00	29.71
Lane Group LOS	E	E	D	E	B	C	B	C
Critical Lane Group	Yes	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.03	3.36	3.20	6.20	0.49	12.05	0.17	12.35
50th-Percentile Queue Length [ft/ln]	150.73	84.08	80.01	155.08	12.20	301.32	4.24	308.68
95th-Percentile Queue Length [veh/ln]	10.06	6.05	5.76	10.29	0.88	17.75	0.30	18.11
95th-Percentile Queue Length [ft/ln]	251.40	151.34	144.01	257.19	21.96	443.67	7.62	452.75

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	61.96	56.29	56.29	52.10	58.08	58.08	19.46	28.64	28.64	19.00	29.71	29.71
Movement LOS	E	E	E	D	E	E	B	C	C	B	C	C
d_A, Approach Delay [s/veh]	59.85			55.94			28.13			29.49		
Approach LOS	E			E			C			C		
d_I, Intersection Delay [s/veh]	38.91											
Intersection LOS	D											
Intersection V/C	0.462											

Emissions

Vehicle Miles Traveled [mph]	3.79	2.25	2.23	4.01	0.64	11.03	0.24	11.07
Stops [stops/h]	145.44	81.13	77.20	149.64	11.77	290.75	4.09	297.85
Fuel consumption [US gal/h]	2.98	1.63	1.39	2.75	0.20	4.78	0.07	4.93
CO [g/h]	208.07	113.86	97.37	192.31	13.86	333.83	4.96	344.69
NOx [g/h]	40.48	22.15	18.94	37.42	2.70	64.95	0.97	67.06
VOC [g/h]	48.22	26.39	22.57	44.57	3.21	77.37	1.15	79.89

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	64.02	64.02	64.02	64.02
l_p,int, Pedestrian LOS Score for Intersectio	2.109	2.087	2.343	2.291
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	312	312	527	527
d_b, Bicycle Delay [s]	53.65	53.43	41.30	40.92
l_b,int, Bicycle LOS Score for Intersection	1.980	1.994	2.373	2.348
Bicycle LOS	A	A	B	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	36.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.629

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

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Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	91	660	236	89	1093	26	44	252	62	341	145	60
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	91	660	236	89	1093	26	44	252	62	341	145	60
Peak Hour Factor	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	25	181	65	24	300	7	12	69	17	94	40	16
Total Analysis Volume [veh/h]	100	724	259	98	1200	29	48	277	68	374	159	66
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			10			0			10		
v_di, Inbound Pedestrian Volume crossing m	0			10			0			10		
v_co, Outbound Pedestrian Volume crossing	0			11			12			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			12			11			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			3			8			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.0	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	Yes	Yes		Yes	Yes			Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes			No			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.00	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	1.00	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	17	60	60	24	67	67	24	24	29	29	29
g / C, Green / Cycle	0.11	0.40	0.40	0.16	0.45	0.45	0.16	0.16	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.06	0.20	0.17	0.06	0.34	0.02	0.11	0.11	0.11	0.09	0.04
s, saturation flow rate [veh/h]	1781	3560	1570	1781	3560	1514	1848	1745	3459	1870	1519
c, Capacity [veh/h]	202	1422	627	285	1588	675	296	279	669	362	294
d1, Uniform Delay [s]	59.73	25.64	24.48	48.64	14.46	10.76	59.33	59.52	54.72	53.34	50.92
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	8.44	1.31	2.01	3.28	3.40	0.12	11.71	13.27	3.36	3.85	1.77
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	0.51	0.41	0.34	0.76	0.04	0.68	0.69	0.56	0.44	0.22
d, Delay for Lane Group [s/veh]	68.17	26.94	26.48	51.92	17.87	10.88	71.04	72.79	58.08	57.19	52.69
Lane Group LOS	E	C	C	D	B	B	E	E	E	E	D
Critical Lane Group	Yes	No	No	No	Yes	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	3.90	7.87	5.42	3.13	8.29	0.29	8.15	8.01	6.75	5.73	2.26
50th-Percentile Queue Length [ft/ln]	97.42	196.84	135.58	78.13	207.33	7.33	203.71	200.37	168.87	143.16	56.50
95th-Percentile Queue Length [veh/ln]	7.01	12.48	9.24	5.63	13.02	0.53	12.83	12.66	11.02	9.65	4.07
95th-Percentile Queue Length [ft/ln]	175.35	311.88	231.06	140.63	325.40	13.19	320.75	316.44	275.42	241.27	101.70

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	68.17	26.94	26.48	51.92	17.87	10.88	71.04	71.83	72.79	58.08	57.19	52.69
Movement LOS	E	C	C	D	B	B	E	E	E	E	E	D
d_A, Approach Delay [s/veh]		30.64			20.23			71.90			57.25	
Approach LOS		C			C			E			E	
d_I, Intersection Delay [s/veh]	36.03											
Intersection LOS	D											
Intersection V/C	0.629											

Emissions

Vehicle Miles Traveled [mph]	2.37	17.17	6.14	2.32	28.45	0.69	4.72	4.58	8.86	3.77	1.56
Stops [stops/h]	93.52	377.93	130.16	75.01	398.07	7.03	195.56	192.36	324.22	137.43	54.24
Fuel consumption [US gal/h]	2.18	7.47	2.61	1.69	8.44	0.14	4.16	4.12	6.58	2.76	1.07
CO [g/h]	152.44	521.87	182.35	117.99	589.99	10.02	290.79	287.68	459.65	193.24	74.90
NOx [g/h]	29.66	101.54	35.48	22.96	114.79	1.95	56.58	55.97	89.43	37.60	14.57
VOC [g/h]	35.33	120.95	42.26	27.34	136.74	2.32	67.39	66.67	106.53	44.78	17.36

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.889	2.184	2.676
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.53	25.33	53.98	52.14
l_b,int, Bicycle LOS Score for Intersection	2.453	2.654	1.884	2.548
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	28.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.661

Intersection Setup

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Base Volume Input [veh/h]	346	473	305	62	117	376
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	346	473	305	62	117	376
Peak Hour Factor	0.8988	0.8988	0.8988	0.8988	0.8988	0.8988
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	96	132	85	17	33	105
Total Analysis Volume [veh/h]	385	526	339	69	130	418
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	106		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		106	
v_co, Outbound Pedestrian Volume crossing	0		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	0		2		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	18		6		8	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	44	35	70	0	33	44
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	18	18	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	0.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	48	93	45	0	37	48
Lead / Lag	Lead	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	3.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	No	Yes		Yes	No
Pedestrian Recall	No	Yes	Yes		No	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	2.60	0.00	0.00
g_i, Effective Green Time [s]	34	91	53	35	71
g / C, Green / Cycle	0.26	0.70	0.41	0.27	0.54
(v / s)_i Volume / Saturation Flow Rate	0.22	0.28	0.23	0.07	0.26
s, saturation flow rate [veh/h]	1781	1870	1806	1781	1577
c, Capacity [veh/h]	462	1310	732	479	827
d1, Uniform Delay [s]	45.49	8.10	29.71	37.44	19.92
k, delay calibration	0.22	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	7.85	0.92	3.05	1.39	2.20
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.83	0.40	0.56	0.27	0.51
d, Delay for Lane Group [s/veh]	53.34	9.02	32.76	38.84	22.12
Lane Group LOS	D	A	C	D	C
Critical Lane Group	Yes	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	12.62	5.97	10.29	3.48	8.61
50th-Percentile Queue Length [ft/ln]	315.59	149.14	257.35	87.04	215.28
95th-Percentile Queue Length [veh/ln]	18.45	9.97	15.56	6.27	13.42
95th-Percentile Queue Length [ft/ln]	461.26	249.28	388.89	156.66	335.60

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	53.34	9.02	32.76	32.76	38.84	22.12
Movement LOS	D	A	C	C	D	C
d_A, Approach Delay [s/veh]	27.75		32.76		26.08	
Approach LOS	C		C		C	
d_I, Intersection Delay [s/veh]	28.35					
Intersection LOS	C					
Intersection V/C	0.661					

Emissions

Vehicle Miles Traveled [mph]	36.88	50.39	9.67	3.08	9.89
Stops [stops/h]	349.57	165.20	285.06	96.41	238.47
Fuel consumption [US gal/h]	8.21	4.13	5.23	1.69	3.61
CO [g/h]	574.12	288.57	365.74	117.89	252.06
NOx [g/h]	111.70	56.15	71.16	22.94	49.04
VOC [g/h]	133.06	66.88	84.76	27.32	58.42

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.31	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.624	0.000	2.283
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1362	623	500
d_b, Bicycle Delay [s]	6.68	30.90	36.71
l_b,int, Bicycle LOS Score for Intersection	3.063	2.233	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



A101

Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	27.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.504

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Base Volume Input [veh/h]	5	517	119	175	486	23	1	7	0	141	11	301
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	517	119	175	486	23	1	7	0	141	11	301
Peak Hour Factor	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	144	33	49	135	6	0	2	0	39	3	84
Total Analysis Volume [veh/h]	6	575	132	195	541	26	1	8	0	157	12	335
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	6			7			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			6			7		
v_co, Outbound Pedestrian Volume crossing	137			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			137		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	27			8			0			13		

A102

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	28	62	25	22	57	0	62	25	62	57	25	57
Amber [s]	3.5	3.5	3.5	3.0	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.6	0.0	0.0	0.0	0.0	2.6	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	9	55	38	37	83	0	55	38	55	83	38	83
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	3.0	3.6	2.9	3.0	3.6	0.0	3.6	2.9	3.6	3.6	2.9	3.6
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	131	131	131	131	131	131	131	131	131	131
L, Total Lost Time per Cycle [s]	4.50	4.60	4.60	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.50	2.60	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	1	71	71	18	89	89	32	32	32	32
g / C, Green / Cycle	0.01	0.55	0.55	0.14	0.68	0.68	0.25	0.25	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.00	0.16	0.10	0.11	0.15	0.15	0.00	0.00	0.13	0.22
s, saturation flow rate [veh/h]	1781	3560	1337	1781	1870	1835	1030	1870	1330	1539
c, Capacity [veh/h]	14	1941	729	250	1270	1246	176	465	384	383
d1, Uniform Delay [s]	64.44	16.09	14.71	54.17	7.93	7.94	50.87	37.00	43.61	46.68
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.10	0.10	0.10	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	19.07	0.39	0.55	5.28	0.41	0.42	0.01	0.01	0.76	8.72
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.43	0.30	0.18	0.78	0.22	0.23	0.01	0.02	0.44	0.88
d, Delay for Lane Group [s/veh]	83.51	16.48	15.26	59.45	8.34	8.36	50.89	37.01	44.36	55.40
Lane Group LOS	F	B	B	E	A	A	D	D	D	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.27	4.68	2.03	6.51	3.02	2.97	0.03	0.20	4.86	11.26
50th-Percentile Queue Length [ft/ln]	6.81	117.08	50.82	162.85	75.39	74.36	0.75	5.03	121.61	281.61
95th-Percentile Queue Length [veh/ln]	0.49	8.23	3.66	10.70	5.43	5.35	0.05	0.36	8.48	16.77
95th-Percentile Queue Length [ft/ln]	12.26	205.81	91.47	267.49	135.71	133.84	1.36	9.05	212.04	419.21

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	83.51	16.48	15.26	59.45	8.35	8.36	50.89	37.01	37.01	44.36	44.36	55.40
Movement LOS	F	B	B	E	A	A	D	D	D	D	D	E
d_A, Approach Delay [s/veh]	16.82			21.43			38.56			51.70		
Approach LOS	B			C			D			D		
d_I, Intersection Delay [s/veh]	27.53											
Intersection LOS	C											
Intersection V/C	0.504											

Emissions

Vehicle Miles Traveled [mph]	0.14	13.63	3.13	18.68	27.37	26.95	0.07	0.59	4.00	7.93
Stops [stops/h]	7.52	258.39	56.07	179.70	83.19	82.05	0.83	5.55	134.19	310.74
Fuel consumption [US gal/h]	0.16	4.39	0.95	4.42	2.15	2.12	0.02	0.10	2.43	5.82
CO [g/h]	11.46	306.95	66.47	309.11	150.56	148.38	1.12	7.19	169.97	406.77
NOx [g/h]	2.23	59.72	12.93	60.14	29.29	28.87	0.22	1.40	33.07	79.14
VOC [g/h]	2.66	71.14	15.40	71.64	34.89	34.39	0.26	1.67	39.39	94.27

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.71	54.71	54.71	54.71
l_p,int, Pedestrian LOS Score for Intersectio	2.961	2.700	1.969	2.231
Crosswalk LOS	C	B	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	774	1203	513	513
d_b, Bicycle Delay [s]	24.86	10.40	36.05	36.29
l_b,int, Bicycle LOS Score for Intersection	2.148	2.188	1.574	2.391
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	52.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.626

Intersection Setup

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Base Volume Input [veh/h]	81	292	170	210	304	14	17	206	94	361	112	411
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	81	292	170	210	304	14	17	206	94	361	112	411
Peak Hour Factor	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	21	76	44	55	79	4	4	54	25	94	29	107
Total Analysis Volume [veh/h]	85	305	178	220	318	15	18	215	98	378	117	430
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	15			5			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			15			5		
v_co, Outbound Pedestrian Volume crossing	6			4			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			4			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	14			7			5			22		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	0	0	0	0	0	0	0	0	0	0	0
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	32	0	39	39	39	0	33	0	46	46	46
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	3	0	3	3	3	0	3	0	3	3	3
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	18	18	18	18	19	19	19	22	22	22	73	73	73
g / C, Green / Cycle	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.15	0.15	0.15	0.49	0.49	0.49
(v / s)_i Volume / Saturation Flow Rate	0.05	0.09	0.09	0.10	0.10	0.10	0.10	0.01	0.11	0.06	0.14	0.14	0.28
s, saturation flow rate [veh/h]	1781	1870	1787	1488	1781	1850	1834	1781	1870	1511	1781	1822	1554
c, Capacity [veh/h]	211	222	212	176	226	235	233	258	271	219	867	886	756
d1, Uniform Delay [s]	61.19	64.08	64.21	64.25	63.60	63.55	63.60	55.37	61.93	58.41	22.95	22.89	27.10
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.15	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.23	5.43	6.13	10.08	6.36	5.95	6.16	0.11	7.16	1.43	0.83	0.79	3.09
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.40	0.77	0.78	0.84	0.80	0.79	0.80	0.07	0.79	0.45	0.28	0.28	0.57
d, Delay for Lane Group [s/veh]	62.42	69.52	70.34	74.34	69.96	69.50	69.76	55.49	69.09	59.84	23.78	23.67	30.19
Lane Group LOS	E	E	E	E	E	E	E	E	E	E	C	C	C
Critical Lane Group	No	No	No	Yes	Yes	No	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.09	6.65	6.53	6.02	7.14	7.33	7.33	0.60	8.49	3.51	5.57	5.57	11.68
50th-Percentile Queue Length [ft/ln]	77.34	166.2	163.1	150.5	178.38	183.32	183.19	15.09	212.33	87.66	139.13	139.20	292.03
95th-Percentile Queue Length [veh/ln]	5.57	10.88	10.72	10.04	11.52	11.77	11.77	1.09	13.27	6.31	9.43	9.44	17.29
95th-Percentile Queue Length [ft/ln]	139.2	271.9	267.8	251.1	287.90	294.35	294.17	27.15	331.81	157.78	235.85	235.95	432.16

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	62.42	69.88	73.92	69.88	69.64	69.76	55.49	69.09	59.84	23.74	23.67	30.19
Movement LOS	E	E	E	E	E	E	E	E	E	C	C	C
d_A, Approach Delay [s/veh]	69.95			69.74			65.61			26.73		
Approach LOS	E			E			E			C		
d_I, Intersection Delay [s/veh]	52.48											
Intersection LOS	D											
Intersection V/C	0.626											

Emissions

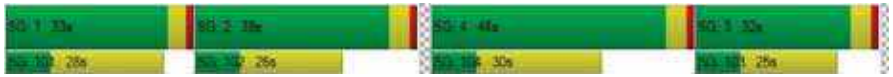
Vehicle Miles Traveled [mph]	2.02	4.02	3.92	3.51	4.28	4.42	4.41	0.43	5.09	2.32	104.98	105.44	182.79
Stops [stops/h]	74.25	159.6	156.6	144.4	171.24	175.99	175.86	14.48	203.83	84.15	133.56	133.63	280.35
Fuel consumption [US gal/h]	1.57	3.45	3.39	3.18	3.69	3.79	3.79	0.30	4.36	1.75	6.43	6.45	11.94
CO [g/h]	109.9	240.9	237.1	222.4	258.24	264.97	265.02	21.02	304.64	122.58	449.33	450.79	834.39
NOx [g/h]	21.39	46.88	46.13	43.28	50.24	51.55	51.56	4.09	59.27	23.85	87.42	87.71	162.34
VOC [g/h]	25.48	55.84	54.95	51.55	59.85	61.41	61.42	4.87	70.60	28.41	104.14	104.48	193.38

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.48	63.48	63.48	63.48
l_p,int, Pedestrian LOS Score for Intersectio	4.283	2.578	2.288	2.736
Crosswalk LOS	E	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	457	383	551
d_b, Bicycle Delay [s]	50.54	44.78	49.17	39.82
l_b,int, Bicycle LOS Score for Intersection	2.853	2.016	2.106	3.086
Bicycle LOS	C	B	B	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	9.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.534

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	53	24	72	27	24	12	1	463	33	29	771	10
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	53	24	72	27	24	12	1	463	33	29	771	10
Peak Hour Factor	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	14	6	19	7	6	3	0	119	8	7	198	3
Total Analysis Volume [veh/h]	55	25	74	28	25	12	1	477	34	30	794	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			1			5		
v_di, Inbound Pedestrian Volume crossing m	5			1			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			6			0		
v_ci, Inbound Pedestrian Volume crossing mi	6			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			5			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	26	0	26	26	26	64	64	64	64	64	64
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	12	12	12	12	70	70	70	70
g / C, Green / Cycle	0.14	0.14	0.14	0.14	0.77	0.77	0.77	0.77
(v / s)_i Volume / Saturation Flow Rate	0.04	0.06	0.02	0.02	0.00	0.28	0.03	0.43
s, saturation flow rate [veh/h]	1367	1620	1287	1750	677	1844	888	1865
c, Capacity [veh/h]	203	219	147	236	479	1427	676	1443
d1, Uniform Delay [s]	38.80	35.85	41.31	34.39	7.59	3.19	5.03	4.05
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.71	1.46	0.62	0.30	0.01	0.70	0.12	1.56
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.27	0.45	0.19	0.16	0.00	0.36	0.04	0.56
d, Delay for Lane Group [s/veh]	39.51	37.31	41.92	34.69	7.60	3.89	5.15	5.61
Lane Group LOS	D	D	D	C	A	A	A	A
Critical Lane Group	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.19	2.09	0.63	0.74	0.01	2.41	0.20	4.89
50th-Percentile Queue Length [ft/ln]	29.74	52.15	15.67	18.40	0.22	60.29	4.91	122.23
95th-Percentile Queue Length [veh/ln]	2.14	3.75	1.13	1.32	0.02	4.34	0.35	8.52
95th-Percentile Queue Length [ft/ln]	53.54	93.87	28.20	33.12	0.39	108.52	8.84	212.89

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	39.51	37.31	37.31	41.92	34.69	34.69	7.60	3.89	3.89	5.15	5.61	5.61
Movement LOS	D	D	D	D	C	C	A	A	A	A	A	A
d_A, Approach Delay [s/veh]	38.09			37.81			3.90			5.59		
Approach LOS	D			D			A			A		
d_I, Intersection Delay [s/veh]	9.57											
Intersection LOS	A											
Intersection V/C	0.534											

Emissions

Vehicle Miles Traveled [mph]	3.94	7.09	2.42	3.20	0.43	217.22	2.98	79.92
Stops [stops/h]	47.59	83.44	25.07	29.44	0.35	96.46	7.85	195.57
Fuel consumption [US gal/h]	0.80	1.39	0.44	0.52	0.02	10.54	0.20	5.26
CO [g/h]	56.05	97.19	31.04	36.22	1.54	736.92	13.68	367.77
NOx [g/h]	10.90	18.91	6.04	7.05	0.30	143.38	2.66	71.55
VOC [g/h]	12.99	22.53	7.19	8.40	0.36	170.79	3.17	85.23

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
l_p,int, Pedestrian LOS Score for Intersectio	2.048	1.968	2.390	2.457
Crosswalk LOS	B	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	487	487	1331	1331
d_b, Bicycle Delay [s]	25.78	25.79	5.05	5.06
l_b,int, Bicycle LOS Score for Intersection	1.814	1.667	2.404	2.936
Bicycle LOS	A	A	B	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	8.9
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.569

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	4	1	3	86	4	28	10	545	5	3	774	57
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	1	3	86	4	28	10	545	5	3	774	57
Peak Hour Factor	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	0	1	22	1	7	3	138	1	1	196	14
Total Analysis Volume [veh/h]	4	1	3	87	4	28	10	551	5	3	782	58
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			6			12		
v_di, Inbound Pedestrian Volume crossing m	12			6			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			10			1		
v_ci, Inbound Pedestrian Volume crossing mi	10			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			6			5			7		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	30.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	36	0	36	36	36	94	94	94	94	94	94
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	14	14	107	107	107	107
g / C, Green / Cycle	0.11	0.11	0.83	0.83	0.83	0.83
(v / s)_i Volume / Saturation Flow Rate	0.01	0.08	0.02	0.30	0.00	0.46
s, saturation flow rate [veh/h]	1584	1440	655	1866	852	1844
c, Capacity [veh/h]	218	208	485	1541	678	1523
d1, Uniform Delay [s]	51.59	55.70	7.83	2.81	4.75	3.62
k, delay calibration	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	2.47	0.08	0.66	0.01	1.44
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.04	0.57	0.02	0.36	0.00	0.55
d, Delay for Lane Group [s/veh]	51.66	58.17	7.91	3.47	4.76	5.07
Lane Group LOS	D	E	A	A	A	A
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.24	3.93	0.11	3.14	0.02	5.83
50th-Percentile Queue Length [ft/ln]	6.02	98.22	2.74	78.46	0.57	145.71
95th-Percentile Queue Length [veh/ln]	0.43	7.07	0.20	5.65	0.04	9.79
95th-Percentile Queue Length [ft/ln]	10.84	176.79	4.93	141.23	1.03	244.69

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	51.66	51.66	51.66	58.17	58.17	58.17	7.91	3.47	3.47	4.76	5.07	5.07
Movement LOS	D	D	D	E	E	E	A	A	A	A	A	A
d_A, Approach Delay [s/veh]	51.66			58.17			3.55			5.07		
Approach LOS	D			E			A			A		
d_I, Intersection Delay [s/veh]	8.86											
Intersection LOS	A											
Intersection V/C	0.569											

Emissions

Vehicle Miles Traveled [mph]	0.23	2.82	0.99	55.27	0.07	19.87
Stops [stops/h]	6.67	108.79	3.03	86.91	0.63	161.40
Fuel consumption [US gal/h]	0.12	2.13	0.07	3.21	0.01	2.58
CO [g/h]	8.38	148.59	5.06	224.47	0.65	180.07
NOx [g/h]	1.63	28.91	0.99	43.67	0.13	35.04
VOC [g/h]	1.94	34.44	1.17	52.02	0.15	41.73

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	1.745	1.838	2.337	2.564
Crosswalk LOS	A	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	491	491	1383	1383
d_b, Bicycle Delay [s]	37.01	37.13	6.20	6.21
l_b,int, Bicycle LOS Score for Intersection	1.573	1.756	2.494	2.951
Bicycle LOS	A	A	B	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	27.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.798

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	73	6	69	54	3	16	15	903	7	30	877	52
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	73	6	69	54	3	16	15	903	7	30	877	52
Peak Hour Factor	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	2	18	14	1	4	4	233	2	8	226	13
Total Analysis Volume [veh/h]	75	6	71	56	3	16	15	930	7	31	903	54
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			18			4		
v_di, Inbound Pedestrian Volume crossing m	18			4			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			6			5		
v_ci, Inbound Pedestrian Volume crossing mi	5			6			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			12			4			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	113	113	113	113	113	113	113	113	113	113
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	12	12	6	6	6	2	73	73	3	75
g / C, Green / Cycle	0.11	0.11	0.05	0.05	0.05	0.01	0.65	0.65	0.03	0.67
(v / s)_i Volume / Saturation Flow Rate	0.08	0.07	0.03	0.03	0.01	0.02	0.28	0.29	0.03	0.63
s, saturation flow rate [veh/h]	937	1184	937	1360	1348	937	1422	1865	937	1527
c, Capacity [veh/h]	99	125	51	74	73	13	924	1212	29	1020
d1, Uniform Delay [s]	49.17	48.39	51.91	51.90	51.08	55.78	9.68	9.69	54.78	16.71
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.23	0.11	0.33
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.21	4.87	6.72	4.64	1.48	182.10	0.70	0.54	95.71	12.39
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.76	0.62	0.47	0.47	0.22	1.20	0.44	0.44	1.06	0.94
d, Delay for Lane Group [s/veh]	60.39	53.26	58.62	56.55	52.57	237.88	10.38	10.22	150.49	29.10
Lane Group LOS	E	D	E	E	D	F	B	B	F	C
Critical Lane Group	Yes	No	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.38	2.26	0.78	1.09	0.48	0.99	4.89	6.37	1.61	23.41
50th-Percentile Queue Length [ft/ln]	59.48	56.53	19.50	27.16	11.94	24.77	122.36	159.15	40.21	585.37
95th-Percentile Queue Length [veh/ln]	4.28	4.07	1.40	1.96	0.86	1.78	8.52	10.50	2.90	31.35
95th-Percentile Queue Length [ft/ln]	107.06	101.76	35.10	48.89	21.49	44.59	213.06	262.60	72.38	783.77

A113

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	60.39	53.26	53.26	57.45	56.55	52.57	237.88	10.29	10.22	150.49	29.10	29.10
Movement LOS	E	D	D	E	E	D	F	B	B	F	C	C
d_A, Approach Delay [s/veh]	56.78			56.36			13.88			32.91		
Approach LOS	E			E			B			C		
d_I, Intersection Delay [s/veh]	27.03											
Intersection LOS	C											
Intersection V/C	0.798											

Emissions

Vehicle Miles Traveled [mph]	3.58	3.67	0.93	1.34	0.61	0.35	9.58	12.57	3.99	123.16
Stops [stops/h]	75.84	72.08	24.87	34.63	15.22	31.59	156.01	202.93	51.27	746.38
Fuel consumption [US gal/h]	1.37	1.28	0.36	0.50	0.22	0.86	1.89	2.45	1.33	14.07
CO [g/h]	96.00	89.20	25.11	35.24	15.23	60.33	131.83	171.24	92.64	983.42
NOx [g/h]	18.68	17.36	4.89	6.86	2.96	11.74	25.65	33.32	18.02	191.34
VOC [g/h]	22.25	20.67	5.82	8.17	3.53	13.98	30.55	39.69	21.47	227.92

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	46.00	46.00	46.00	46.00
l_p,int, Pedestrian LOS Score for Intersectio	2.003	2.154	2.537	2.741
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	531	531	354	354
d_b, Bicycle Delay [s]	30.51	30.64	38.32	38.32
l_b,int, Bicycle LOS Score for Intersection	1.810	1.683	2.345	3.190
Bicycle LOS	A	A	B	C

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	32.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.982

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	254	58	43	1173	1095	590
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	254	58	43	1173	1095	590
Peak Hour Factor	0.9360	0.9360	0.9360	0.9360	0.9360	0.9360
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	68	15	11	313	292	158
Total Analysis Volume [veh/h]	271	62	46	1253	1170	630
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	2		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		4		8	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	18	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	20	12	60	48	48
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	76	76	76	76	76	76
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	24	24	3	42	36	36
g / C, Green / Cycle	0.31	0.31	0.04	0.56	0.48	0.48
(v / s)_i Volume / Saturation Flow Rate	0.29	0.04	0.04	0.48	0.42	0.52
s, saturation flow rate [veh/h]	937	1589	1312	2623	2792	1222
c, Capacity [veh/h]	293	496	51	1469	1325	580
d1, Uniform Delay [s]	25.24	18.67	36.29	14.07	18.03	19.47
k, delay calibration	0.11	0.04	0.04	0.15	0.15	0.49
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	12.18	0.04	17.26	2.12	2.99	62.82
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.93	0.12	0.89	0.85	0.88	1.09
d, Delay for Lane Group [s/veh]	37.42	18.71	53.55	16.19	21.03	82.30
Lane Group LOS	D	B	D	B	C	F
Critical Lane Group	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	5.41	0.75	1.07	8.07	8.54	18.66
50th-Percentile Queue Length [ft/ln]	135.31	18.85	26.84	201.76	213.38	466.58
95th-Percentile Queue Length [veh/ln]	9.23	1.36	1.93	12.73	13.33	27.32
95th-Percentile Queue Length [ft/ln]	230.69	33.93	48.31	318.23	333.16	682.94

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	37.42	18.71	53.55	16.19	21.03	82.30
Movement LOS	D	B	D	B	C	F
d_A, Approach Delay [s/veh]	33.94		17.51		42.47	
Approach LOS	C		B		D	
d_I, Intersection Delay [s/veh]	32.20					
Intersection LOS	C					
Intersection V/C	0.982					

Emissions

Vehicle Miles Traveled [mph]	6.42	1.47	5.92	161.25	27.72	14.92
Stops [stops/h]	257.23	35.84	51.02	767.13	811.31	887.02
Fuel consumption [US gal/h]	3.75	0.49	1.03	15.01	12.16	17.79
CO [g/h]	262.06	34.57	71.78	1048.90	850.29	1243.49
NOx [g/h]	50.99	6.73	13.96	204.08	165.44	241.94
VOC [g/h]	60.73	8.01	16.63	243.09	197.06	288.19

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	27.67	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.259	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	417	1439	1122
d_b, Bicycle Delay [s]	23.72	2.99	7.33
l_b,int, Bicycle LOS Score for Intersection	1.560	2.631	3.045
Bicycle LOS	A	B	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	74.1
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.583

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Southwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

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Version 2024 (SP 0-6) 2/4/2026

Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	250	0	240	0	853	574	0	1445	1040	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	250	0	240	0	853	574	0	1445	1040	0	0	0
Peak Hour Factor	0.9611	1.0000	0.9611	1.0000	0.9611	0.9611	1.0000	0.9611	0.9611	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	65	0	62	0	222	149	0	376	271	0	0	0
Total Analysis Volume [veh/h]	260	0	250	0	888	597	0	1503	1082	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			8		
v_ci, Inbound Pedestrian Volume crossing mi	0			8			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			4			8			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	23	0	0	0	57	0	0	57	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	4	0	0	4	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				No			No				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Version 2024 (SP 0-6) 2/4/2026

Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	80	80	80	80	80	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
I2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	10	10	62	62	62	
g / C, Green / Cycle	0.13	0.13	0.77	0.77	0.77	
(v / s)_i Volume / Saturation Flow Rate	0.08	0.09	0.17	0.30	1.18	
s, saturation flow rate [veh/h]	3459	2813	5094	5094	919	
c, Capacity [veh/h]	437	355	3941	3941	711	
d1, Uniform Delay [s]	33.02	33.51	2.48	2.91	8.37	
k, delay calibration	0.11	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	1.30	2.55	0.13	0.28	242.16	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.60	0.70	0.23	0.38	1.52	
d, Delay for Lane Group [s/veh]	34.32	36.06	2.61	3.19	250.53	
Lane Group LOS	C	D	A	A	F	
Critical Lane Group	No	Yes	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	2.41	2.40	0.81	1.61	53.97	
50th-Percentile Queue Length [ft/ln]	60.16	59.93	20.20	40.21	1349.17	
95th-Percentile Queue Length [veh/ln]	4.33	4.32	1.45	2.89	87.74	
95th-Percentile Queue Length [ft/ln]	108.28	107.88	36.36	72.37	2193.46	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	34.32	0.00	36.06	0.00	2.61	0.00	0.00	3.19	250.53	0.00	0.00	0.00
Movement LOS	C		D		A			A	F			
d_A, Approach Delay [s/veh]	35.17			1.59			106.72			0.00		
Approach LOS	D			A			F			A		
d_I, Intersection Delay [s/veh]	74.12											
Intersection LOS	E											
Intersection V/C	1.583											

Emissions

Vehicle Miles Traveled [mph]	6.16	5.93	20.99	149.55	107.66	
Stops [stops/h]	216.57	215.76	109.07	217.11	2428.50	
Fuel consumption [US gal/h]	3.27	3.27	1.94	8.33	73.00	
CO [g/h]	228.28	228.61	135.55	582.32	5102.89	
NOx [g/h]	44.42	44.48	26.37	113.30	992.84	
VOC [g/h]	52.91	52.98	31.42	134.96	1182.64	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	31.51	0.00	31.51
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.957	0.000	1.419
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	475	1325	1325	0
d_b, Bicycle Delay [s]	23.26	4.57	4.57	40.00
l_b,int, Bicycle LOS Score for Intersection	1.560	2.048	2.981	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	27.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.982

Intersection Setup

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	200.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	497	0	617	0	0	0	0	749	354	0	1988	415
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	497	0	617	0	0	0	0	749	354	0	1988	415
Peak Hour Factor	0.9889	1.0000	0.9889	1.0000	1.0000	1.0000	1.0000	0.9889	0.9889	1.0000	0.9889	0.9889
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	126	0	156	0	0	0	0	189	89	0	503	105
Total Analysis Volume [veh/h]	503	0	624	0	0	0	0	757	358	0	2010	420
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			4			8		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Split	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	7	0	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	30	0	0	50	0	0	58	0
Amber [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	5	0	5	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	10	0	10	0	10	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No			No	
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	0	10	0	20	0	0	50	0	0	50	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	5	0	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No		No			No			No	
Maximum Recall	No		No		No			No			No	
Pedestrian Recall	No		No		No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	R	C	R
C, Calculated Cycle Length [s]	80	80	80	80	80	80	80
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	16	26	16	46	46	56	46
g / C, Green / Cycle	0.20	0.33	0.20	0.58	0.58	0.70	0.58
(v / s)_i Volume / Saturation Flow Rate	0.18	0.22	0.00	0.15	0.23	0.71	0.49
s, saturation flow rate [veh/h]	2752	2813	1870	5094	1554	2828	860
c, Capacity [veh/h]	572	914	419	2929	893	1980	495
d1, Uniform Delay [s]	31.41	23.42	0.00	8.49	9.33	12.00	13.78
k, delay calibration	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.60	0.91	0.00	0.21	1.34	24.09	16.46
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.88	0.68	0.00	0.26	0.40	1.02	0.85
d, Delay for Lane Group [s/veh]	36.01	24.33	0.00	8.70	10.67	36.09	30.25
Lane Group LOS	D	C	A	A	B	F	C
Critical Lane Group	No	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.96	4.97	0.00	2.00	3.36	12.74	7.52
50th-Percentile Queue Length [ft/ln]	123.91	124.32	0.00	50.06	84.10	318.42	187.99
95th-Percentile Queue Length [veh/ln]	8.61	8.63	0.00	3.60	6.06	18.82	12.02
95th-Percentile Queue Length [ft/ln]	215.19	215.75	0.00	90.11	151.38	470.47	300.41

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	36.01	0.00	24.33	0.00	0.00	0.00	0.00	8.70	10.67	0.00	36.09	30.25
Movement LOS	D		C	A	A	A		A	B		F	C
d_A, Approach Delay [s/veh]	29.54			0.00			9.33			35.08		
Approach LOS	C			A			A			D		
d_I, Intersection Delay [s/veh]	27.60											
Intersection LOS	C											
Intersection V/C	0.982											

Emissions

Vehicle Miles Traveled [mph]	11.92	14.79	0.00	75.32	35.62	47.50	9.93
Stops [stops/h]	446.09	447.56	0.00	270.32	151.38	1719.45	338.37
Fuel consumption [US gal/h]	6.64	6.17	0.00	5.93	3.08	26.22	4.86
CO [g/h]	464.23	431.35	0.00	414.83	215.28	1832.46	339.95
NOx [g/h]	90.32	83.92	0.00	80.71	41.89	356.53	66.14
VOC [g/h]	107.59	99.97	0.00	96.14	49.89	424.69	78.79

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0		9.0	0.0		0.0	
M_corner, Corner Circulation Area [ft²/ped]	0.00		0.00	0.00		0.00	
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00		0.00	0.00		0.00	
d_p, Pedestrian Delay [s]	31.51		31.51	0.00		0.00	
I_p,int, Pedestrian LOS Score for Intersectio	2.585		1.915	0.000		0.000	
Crosswalk LOS	B		A	F		F	
s_b, Saturation Flow Rate of the bicycle lane	2000		2000	2000		2000	
c_b, Capacity of the bicycle lane [bicycles/h]	400		400	1150		1400	
d_b, Bicycle Delay [s]	25.60		25.60	7.24		3.61	
I_b,int, Bicycle LOS Score for Intersection	1.560		1.560	2.173		2.896	
Bicycle LOS	A		A	B		C	

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.PM.vistro Scenario 16 Existing PM
Report File: C:\...\E PM.pdf 2/4/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road/101 NB Ramps	Signalized	HCM 7th Edition	WB Left	0.777	17.1	B
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	EB Left	0.730	22.3	C
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	NB Left	0.647	19.6	B
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	SB Left	0.675	33.6	C
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	SB Left	0.474	21.5	C
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	EB Thru	0.524	59.1	E
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	NB Left	0.673	28.6	C
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	NB Left	0.472	30.0	C
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	NB Left	0.512	26.5	C
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	SB Left	0.600	53.1	D
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	SB Left	0.637	11.8	B
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.672	11.0	B
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	EB Left	0.591	14.8	B
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	EB Left	0.831	13.5	B
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	SB Left	0.696	17.9	B
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	0.529	34.8	C

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V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road/101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	17.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.777

Intersection Setup

Name	Marsh Road		Marsh Road		101 NB Ramps	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

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Volumes

Name	Marsh Road		Marsh Road		101 NB Ramps	
Base Volume Input [veh/h]	1819	0	0	818	604	181
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1819	0	0	818	604	181
Peak Hour Factor	0.9490	1.0000	1.0000	0.9490	0.9490	0.9490
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	479	0	0	215	159	48
Total Analysis Volume [veh/h]	1917	0	0	862	636	191
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		3		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		3	
v_co, Outbound Pedestrian Volume crossing	5		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		5	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		2		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	100	0	0	100	100	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	70	0	0	70	30	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	Yes	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	68	68	28	28
g / C, Green / Cycle	0.68	0.68	0.28	0.28
(v / s)_i Volume / Saturation Flow Rate	0.54	0.24	0.18	0.07
s, saturation flow rate [veh/h]	3560	3560	3459	2798
c, Capacity [veh/h]	2403	2403	968	784
d1, Uniform Delay [s]	11.44	6.97	31.76	27.81
k, delay calibration	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.86	0.42	3.48	0.74
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.80	0.36	0.66	0.24
d, Delay for Lane Group [s/veh]	14.30	7.39	35.24	28.55
Lane Group LOS	B	A	D	C
Critical Lane Group	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	13.71	3.63	7.14	1.83
50th-Percentile Queue Length [ft/ln]	342.82	90.83	178.43	45.85
95th-Percentile Queue Length [veh/ln]	19.79	6.54	11.52	3.30
95th-Percentile Queue Length [ft/ln]	494.65	163.50	287.96	82.53

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	14.30	0.00	0.00	7.39	35.24	28.55
Movement LOS	B			A	D	C
d_A, Approach Delay [s/veh]	14.30		7.39		33.69	
Approach LOS	B		A		C	
d_I, Intersection Delay [s/veh]	17.10					
Intersection LOS	B					
Intersection V/C	0.777					

Emissions

Vehicle Miles Traveled [mph]	45.32	20.38	15.08	4.53
Stops [stops/h]	987.33	261.60	513.87	132.05
Fuel consumption [US gal/h]	12.90	3.58	8.02	2.03
CO [g/h]	901.80	250.25	560.63	141.59
NOx [g/h]	175.46	48.69	109.08	27.55
VOC [g/h]	209.00	58.00	129.93	32.81

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	41.41	39.61
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.862	2.337
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1308	1308	516
d_b, Bicycle Delay [s]	5.99	5.99	27.53
l_b,int, Bicycle LOS Score for Intersection	3.141	2.271	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	22.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.730

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	821	1056	279	1267	537
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	821	1056	279	1267	537
Peak Hour Factor	1.0000	0.9770	0.9770	1.0000	0.9770	0.9770
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	210	270	70	324	137
Total Analysis Volume [veh/h]	0	840	1081	279	1297	550
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		1	
v_co, Outbound Pedestrian Volume crossing	0		6		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		6	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		4		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	100	100	0	100	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	12	16	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	40	40	0	60	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	55	53	40	40
g / C, Green / Cycle	0.55	0.53	0.40	0.40
(v / s)_i Volume / Saturation Flow Rate	0.21	0.30	0.38	0.35
s, saturation flow rate [veh/h]	4000	3560	3459	1588
c, Capacity [veh/h]	2216	1898	1387	637
d1, Uniform Delay [s]	12.59	15.66	28.71	27.44
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.49	1.25	1.43	1.40
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.38	0.57	0.94	0.86
d, Delay for Lane Group [s/veh]	13.08	16.90	30.14	28.84
Lane Group LOS	B	B	C	C
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	5.08	7.98	14.56	11.82
50th-Percentile Queue Length [ft/ln]	127.03	199.42	363.89	295.55
95th-Percentile Queue Length [veh/ln]	8.78	12.61	20.81	17.46
95th-Percentile Queue Length [ft/ln]	219.44	315.22	520.31	436.52

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	13.08	16.90	0.00	30.14	28.84
Movement LOS		B	B		C	C
d_A, Approach Delay [s/veh]	13.08		16.90		29.75	
Approach LOS	B		B		C	
d_I, Intersection Delay [s/veh]	22.35					
Intersection LOS	C					
Intersection V/C	0.730					

Emissions

Vehicle Miles Traveled [mph]	19.90	25.62	30.67	13.01
Stops [stops/h]	365.83	574.34	1047.99	425.59
Fuel consumption [US gal/h]	5.75	9.01	15.01	6.11
CO [g/h]	401.67	630.11	1049.03	427.39
NOx [g/h]	78.15	122.60	204.10	83.15
VOC [g/h]	93.09	146.03	243.12	99.05

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	41.41	0.00	39.61
l_p,int, Pedestrian LOS Score for Intersectio	2.840	0.000	2.545
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	708	708	1118
d_b, Bicycle Delay [s]	20.87	20.91	9.72
l_b,int, Bicycle LOS Score for Intersection	2.253	2.451	1.560
Bicycle LOS	B	B	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	19.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.647

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Base Volume Input [veh/h]	32	1197	2	52	1246	295	248	4	2	12	5	142
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	32	1197	2	52	1246	295	248	4	2	12	5	142
Peak Hour Factor	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	306	1	13	318	75	63	1	1	3	1	36
Total Analysis Volume [veh/h]	33	1223	2	53	1273	301	253	4	2	12	5	145
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	8			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			8			0		
v_co, Outbound Pedestrian Volume crossing	1			0			1			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			1			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	0	1	6	0	0	4	0	0	3	0
Auxiliary Signal Groups												
Maximum Green [s]	15	40	0	10	40	0	0	20	0	0	20	0
Amber [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	7	0	0	8	0	0	8	0
Pedestrian Clearance [s]	0	21	0	0	21	0	0	24	0	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	57	0	20	62	0	0	32	0	0	36	0
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	4	10	0	0	4	0	0	6	0
Vehicle Extension [s]	2.5	3.5	0.0	2.0	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Version 2024 (SP 0-6) 2/4/2026

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	5	102	102	6	102	102	18	18	12	12
g / C, Green / Cycle	0.04	0.70	0.70	0.04	0.70	0.70	0.12	0.12	0.08	0.08
(v / s)_i Volume / Saturation Flow Rate	0.02	0.23	0.23	0.02	0.43	0.44	0.07	0.07	0.01	0.05
s, saturation flow rate [veh/h]	1781	3560	1868	3459	1870	1749	1781	1780	1806	2813
c, Capacity [veh/h]	67	2498	1311	137	1316	1231	217	217	148	230
d1, Uniform Delay [s]	68.43	8.33	8.33	67.91	11.13	11.39	60.30	60.30	61.72	64.46
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.13	0.34	0.65	0.66	2.11	2.43	1.95	1.95	0.25	2.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.49	0.32	0.32	0.39	0.61	0.63	0.60	0.60	0.12	0.63
d, Delay for Lane Group [s/veh]	72.56	8.67	8.98	68.57	13.24	13.82	62.25	62.25	61.98	66.58
Lane Group LOS	E	A	A	E	B	B	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	1.28	4.73	5.07	0.97	13.12	13.01	4.69	4.69	0.60	2.69
50th-Percentile Queue Length [ft/ln]	31.89	118.18	126.85	24.25	328.00	325.21	117.19	117.16	14.99	67.31
95th-Percentile Queue Length [veh/ln]	2.30	8.29	8.77	1.75	19.06	18.92	8.24	8.24	1.08	4.85
95th-Percentile Queue Length [ft/ln]	57.40	207.33	219.20	43.65	476.51	473.08	205.96	205.91	26.99	121.16

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	72.56	8.78	8.98	68.57	13.45	13.82	62.25	62.25	62.25	61.98	61.98	66.58
Movement LOS	E	A	A	E	B	B	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	10.45			15.32			62.25			66.10		
Approach LOS	B			B			E			E		
d_I, Intersection Delay [s/veh]	19.63											
Intersection LOS	B											
Intersection V/C	0.647											

Emissions

Vehicle Miles Traveled [mph]	7.16	174.42	91.53	1.26	18.98	18.29	3.91	3.90	1.10	9.37
Stops [stops/h]	31.67	234.74	125.97	48.17	325.74	322.96	116.38	116.35	14.89	133.69
Fuel consumption [US gal/h]	1.00	9.83	5.21	1.15	5.33	5.30	2.26	2.26	0.32	2.90
CO [g/h]	69.79	687.21	363.95	80.36	372.76	370.36	158.16	158.11	22.43	202.62
NOx [g/h]	13.58	133.71	70.81	15.63	72.52	72.06	30.77	30.76	4.36	39.42
VOC [g/h]	16.17	159.27	84.35	18.62	86.39	85.83	36.65	36.64	5.20	46.96

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	61.00	61.00	61.92	61.92
l_p,int, Pedestrian LOS Score for Intersectio	2.958	3.144	2.125	2.359
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	717	786	383	439
d_b, Bicycle Delay [s]	29.82	26.70	47.36	44.19
l_b,int, Bicycle LOS Score for Intersection	2.252	2.902	1.987	1.827
Bicycle LOS	B	C	A	A

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	33.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.675

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Base Volume Input [veh/h]	182	683	24	3	798	492	476	17	131	42	21	22
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	182	683	24	3	798	492	476	17	131	42	21	22
Peak Hour Factor	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	47	175	6	1	205	126	122	4	34	11	5	6
Total Analysis Volume [veh/h]	187	702	25	3	820	506	489	17	135	43	22	23
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	15			6			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			15			6		
v_co, Outbound Pedestrian Volume crossing	3			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			3		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			1			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	31.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	50	50	50	0	50	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	22	45	45	22	45	45	37	36	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	140	140	140	140	140	140	140	140	140	140	140
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	18	90	90	2	74	74	27	27	27	13	13
g / C, Green / Cycle	0.13	0.64	0.64	0.02	0.53	0.53	0.19	0.19	0.19	0.09	0.09
(v / s)_i Volume / Saturation Flow Rate	0.11	0.20	0.20	0.00	0.38	0.38	0.14	0.14	0.09	0.02	0.03
s, saturation flow rate [veh/h]	1781	1870	1844	1781	1870	1632	1781	1787	1532	1781	1696
c, Capacity [veh/h]	233	1202	1185	32	991	865	340	342	293	162	154
d1, Uniform Delay [s]	59.09	11.11	11.11	67.63	24.77	25.06	53.37	53.37	50.05	59.26	59.41
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.45	0.65	0.66	0.47	4.27	5.19	2.39	2.38	0.84	0.64	0.77
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.80	0.30	0.30	0.09	0.71	0.72	0.74	0.74	0.46	0.27	0.29
d, Delay for Lane Group [s/veh]	61.54	11.76	11.78	68.10	29.04	30.25	55.76	55.75	50.89	59.90	60.17
Lane Group LOS	E	B	B	E	C	C	E	E	D	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.57	5.11	5.05	0.11	18.20	16.57	8.70	8.73	4.32	1.47	1.54
50th-Percentile Queue Length [ft/ln]	164.29	127.74	126.34	2.74	455.00	414.35	217.61	218.20	107.93	36.75	38.61
95th-Percentile Queue Length [veh/ln]	10.78	8.82	8.74	0.20	25.20	23.25	13.54	13.57	7.72	2.65	2.78
95th-Percentile Queue Length [ft/ln]	269.39	220.42	218.51	4.93	629.91	581.27	338.57	339.33	193.11	66.14	69.50

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	61.54	11.77	11.78	68.10	29.21	30.25	55.75	55.75	50.89	59.90	60.17	60.17
Movement LOS	E	B	B	E	C	C	E	E	D	E	E	E
d_A, Approach Delay [s/veh]	21.95			29.69			54.73			60.04		
Approach LOS	C			C			D			E		
d_I, Intersection Delay [s/veh]	33.61											
Intersection LOS	C											
Intersection V/C	0.675											

Emissions

Vehicle Miles Traveled [mph]	29.47	57.63	56.94	0.65	152.33	135.54	29.24	29.33	15.63	2.43	2.54
Stops [stops/h]	168.98	131.39	129.95	2.82	468.00	426.19	223.82	224.44	111.01	37.80	39.72
Fuel consumption [US gal/h]	4.74	4.06	4.01	0.09	13.47	12.21	5.04	5.05	2.53	0.78	0.82
CO [g/h]	331.03	283.80	280.55	6.12	941.69	853.80	352.29	353.26	176.60	54.40	57.15
NOx [g/h]	64.41	55.22	54.58	1.19	183.22	166.12	68.54	68.73	34.36	10.58	11.12
VOC [g/h]	76.72	65.77	65.02	1.42	218.25	197.88	81.65	81.87	40.93	12.61	13.24

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.43	59.43	59.43	59.43
l_p,int, Pedestrian LOS Score for Intersectio	2.836	3.028	2.428	1.997
Crosswalk LOS	C	C	B	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	577	577	457	469
d_b, Bicycle Delay [s]	35.45	35.43	41.68	41.04
l_b,int, Bicycle LOS Score for Intersection	2.314	2.656	2.617	1.705
Bicycle LOS	B	B	B	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	21.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.474

Intersection Setup

Name	Marsh Road			Marsh Road			Bay Road			Bay Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			No		

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Volumes

Name	Marsh Road			Marsh Road			Bay Road			Bay Road		
Base Volume Input [veh/h]	3	697	68	156	755	71	71	34	6	63	21	117
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	697	68	156	755	71	71	34	6	63	21	117
Peak Hour Factor	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	185	18	41	200	19	19	9	2	17	6	31
Total Analysis Volume [veh/h]	3	740	72	166	801	75	75	36	6	67	22	124
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			13			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			13		
v_co, Outbound Pedestrian Volume crossing	0			2			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			2			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			4			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	4.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	0	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	17	0	0	0	17	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	105	70	105	35	105	70	45	45	45	0	45	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
I2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	97	97	18	118	118	27	27
g / C, Green / Cycle	0.65	0.65	0.12	0.79	0.79	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.23	0.23	0.09	0.24	0.24	0.11	0.13
s, saturation flow rate [veh/h]	1864	1639	1781	1870	1806	1045	1581
c, Capacity [veh/h]	1231	1062	214	1474	1423	229	318
d1, Uniform Delay [s]	12.12	12.15	64.00	4.42	4.43	56.94	57.86
k, delay calibration	0.50	0.50	0.11	0.50	0.50	0.23	0.23
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.79	0.95	5.88	0.53	0.55	3.74	5.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.35	0.36	0.77	0.30	0.30	0.51	0.67
d, Delay for Lane Group [s/veh]	12.91	13.10	69.88	4.95	4.98	60.68	62.98
Lane Group LOS	B	B	E	A	A	E	E
Critical Lane Group	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.77	6.04	6.49	3.55	3.46	4.44	8.12
50th-Percentile Queue Length [ft/ln]	169.32	151.08	162.29	88.70	86.39	111.05	202.96
95th-Percentile Queue Length [veh/ln]	11.04	10.07	10.67	6.39	6.22	7.90	12.79
95th-Percentile Queue Length [ft/ln]	276.02	251.87	266.76	159.66	155.51	197.46	319.78

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	12.91	12.99	13.10	69.88	4.96	4.98	60.68	60.68	60.68	62.98	62.98	62.98
Movement LOS	B	B	B	E	A	A	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	13.00			15.31			60.68			62.98		
Approach LOS	B			B			E			E		
d_I, Intersection Delay [s/veh]	21.52											
Intersection LOS	C											
Intersection V/C	0.474											

Emissions

Vehicle Miles Traveled [mph]	10.23	9.04	26.16	70.06	67.99	9.09	5.05
Stops [stops/h]	162.55	145.04	155.80	85.15	82.94	106.61	194.84
Fuel consumption [US gal/h]	2.75	2.45	4.53	3.76	3.65	2.26	4.01
CO [g/h]	192.12	171.59	316.59	262.75	255.31	158.15	280.59
NOx [g/h]	37.38	33.38	61.60	51.12	49.67	30.77	54.59
VOC [g/h]	44.53	39.77	73.37	60.89	59.17	36.65	65.03

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	99.9	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	64.40	8.37	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.882	1.750	0.000
Crosswalk LOS	F	C	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	865	1332	537	537
d_b, Bicycle Delay [s]	24.16	8.38	40.11	40.11
l_b,int, Bicycle LOS Score for Intersection	2.232	2.419	1.753	1.911
Bicycle LOS	B	B	A	A

Sequence

Ring 1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	59.1
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.524

Intersection Setup

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	149	99	21	40	97	23	100	525	60	20	351	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	149	99	21	40	97	23	100	525	60	20	351	9
Peak Hour Factor	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	40	27	6	11	26	6	27	141	16	5	94	2
Total Analysis Volume [veh/h]	160	106	22	43	104	25	107	562	64	21	376	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			10			11		
v_di, Inbound Pedestrian Volume crossing m	11			10			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			12			12		
v_ci, Inbound Pedestrian Volume crossing mi	12			12			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	7			8			6			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	180
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	35	35	35	35	35	35	30	60	60	30	30	30
Amber [s]	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	46	40	46	40	46	13	84	84	10	81	81
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	4	4	4	4	4
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	180	180	180	180	180	180	180	180
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	0.00	2.10	0.00	2.00
g_i, Effective Green Time [s]	60	60	36	36	72	65	72	59
g / C, Green / Cycle	0.33	0.33	0.20	0.20	0.40	0.36	0.40	0.33
(v / s)_i Volume / Saturation Flow Rate	0.09	0.07	0.02	0.07	0.10	0.34	0.02	0.21
s, saturation flow rate [veh/h]	1781	1799	1781	1783	1116	1827	872	1859
c, Capacity [veh/h]	588	594	355	356	341	659	151	614
d1, Uniform Delay [s]	44.35	43.46	59.11	62.18	37.47	55.92	42.68	50.94
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.29	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.14	0.83	0.70	2.85	0.52	17.07	0.41	1.07
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.27	0.22	0.12	0.36	0.31	0.95	0.14	0.63
d, Delay for Lane Group [s/veh]	45.49	44.29	59.80	65.03	37.99	72.98	43.10	52.00
Lane Group LOS	D	D	E	E	D	E	D	D
Critical Lane Group	Yes	No	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	5.56	4.35	1.72	5.48	3.15	30.81	0.60	15.10
50th-Percentile Queue Length [ft/ln]	139.08	108.80	42.88	136.96	78.64	770.25	14.89	377.42
95th-Percentile Queue Length [veh/ln]	9.43	7.77	3.09	9.32	5.66	39.91	1.07	21.47
95th-Percentile Queue Length [ft/ln]	235.78	194.33	77.19	232.92	141.56	997.83	26.79	536.72

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	45.49	44.29	44.29	59.80	65.03	65.03	37.99	72.98	72.98	43.10	52.00	52.00
Movement LOS	D	D	D	E	E	E	D	E	E	D	D	D
d_A, Approach Delay [s/veh]	44.95			63.72			67.88			51.54		
Approach LOS	D			E			E			D		
d_I, Intersection Delay [s/veh]	59.15											
Intersection LOS	E											
Intersection V/C	0.524											

Emissions

Vehicle Miles Traveled [mph]	3.79	3.03	1.02	3.06	2.53	14.81	0.50	9.14
Stops [stops/h]	111.26	87.04	34.31	109.57	62.92	616.20	11.91	301.94
Fuel consumption [US gal/h]	2.25	1.76	0.70	2.26	1.28	13.31	0.27	6.13
CO [g/h]	157.39	122.97	48.98	158.30	89.40	930.40	18.90	428.40
NOx [g/h]	30.62	23.92	9.53	30.80	17.39	181.02	3.68	83.35
VOC [g/h]	36.48	28.50	11.35	36.69	20.72	215.63	4.38	99.29

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	79.34	79.34	79.34	79.34
l_p,int, Pedestrian LOS Score for Intersectio	2.139	2.132	2.393	2.309
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	460	393	881	848
d_b, Bicycle Delay [s]	53.55	58.31	28.25	30.04
l_b,int, Bicycle LOS Score for Intersection	2.035	1.843	2.769	2.231
Bicycle LOS	B	A	C	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	28.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.673

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	1	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

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Version 2024 (SP 0-6) 2/4/2026

Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	97	1274	513	140	863	55	54	274	73	312	175	59
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	97	1274	513	140	863	55	54	274	73	312	175	59
Peak Hour Factor	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	25	324	130	36	219	14	14	70	19	79	45	15
Total Analysis Volume [veh/h]	99	1296	522	142	878	56	55	279	74	317	178	60
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			12		
v_di, Inbound Pedestrian Volume crossing m	0			12			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			48			64		
v_ci, Inbound Pedestrian Volume crossing mi	64			48			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			11			14		

Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.2	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.20	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	1.20	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	12	78	78	16	82	82	20	20	23	23	23
g / C, Green / Cycle	0.08	0.52	0.52	0.10	0.55	0.55	0.14	0.14	0.15	0.15	0.15
(v / s)_i Volume / Saturation Flow Rate	0.06	0.36	0.34	0.08	0.25	0.04	0.11	0.12	0.09	0.10	0.04
s, saturation flow rate [veh/h]	1781	3560	1531	1781	3560	1529	1846	1734	3459	1870	1502
c, Capacity [veh/h]	141	1856	798	185	1940	833	250	235	524	283	228
d1, Uniform Delay [s]	65.37	15.88	15.02	60.25	3.40	3.16	63.12	63.35	59.44	59.67	56.11
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.37	2.21	4.15	2.50	0.76	0.16	2.68	3.37	0.42	0.86	0.23
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.70	0.70	0.65	0.77	0.45	0.07	0.83	0.85	0.60	0.63	0.26
d, Delay for Lane Group [s/veh]	67.73	18.08	19.17	62.75	4.17	3.32	65.80	66.73	59.86	60.53	56.33
Lane Group LOS	E	B	B	E	A	A	E	E	E	E	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.68	11.31	8.84	4.97	1.67	0.21	7.93	7.74	5.70	6.46	2.04
50th-Percentile Queue Length [ft/ln]	91.94	282.65	220.99	124.25	41.78	5.37	198.22	193.38	142.44	161.41	50.98
95th-Percentile Queue Length [veh/ln]	6.62	16.82	13.72	8.63	3.01	0.39	12.55	12.30	9.61	10.62	3.67
95th-Percentile Queue Length [ft/ln]	165.49	420.51	342.89	215.65	75.21	9.67	313.67	307.42	240.30	265.59	91.77

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	67.73	18.08	19.17	62.75	4.17	3.32	65.80	66.22	66.73	59.86	60.53	56.33
Movement LOS	E	B	B	E	A	A	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	20.94			11.85			66.26			59.69		
Approach LOS	C			B			E			E		
d_I, Intersection Delay [s/veh]	28.58											
Intersection LOS	C											
Intersection V/C	0.673											

Emissions

Vehicle Miles Traveled [mph]	2.35	30.73	12.38	3.37	20.82	1.33	4.91	4.75	7.51	4.22	1.42
Stops [stops/h]	88.26	542.69	212.15	119.28	80.22	5.16	190.29	185.65	273.48	154.95	48.95
Fuel consumption [US gal/h]	2.12	10.02	4.10	2.84	2.14	0.13	4.03	3.94	5.68	3.22	1.02
CO [g/h]	148.03	700.51	286.84	198.40	149.69	8.89	281.73	275.72	397.10	225.20	71.06
NOx [g/h]	28.80	136.29	55.81	38.60	29.12	1.73	54.81	53.64	77.26	43.82	13.83
VOC [g/h]	34.31	162.35	66.48	45.98	34.69	2.06	65.29	63.90	92.03	52.19	16.47

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.950	2.334	2.719
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.52	25.30	54.06	52.45
l_b,int, Bicycle LOS Score for Intersection	3.141	2.447	1.896	2.475
Bicycle LOS	C	B	A	B

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	30.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.472

Intersection Setup

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Base Volume Input [veh/h]	297	584	333	66	157	493
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	297	584	333	66	157	493
Peak Hour Factor	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	76	150	86	17	40	127
Total Analysis Volume [veh/h]	306	602	343	68	162	508
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		2	
v_di, Inbound Pedestrian Volume crossing m	2		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		12	
v_ci, Inbound Pedestrian Volume crossing mi	0		12		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	2		2		3	

Generated with PTV VISTRO
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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	34	35	70	0	35	34
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	18	18	0	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	2.5	6.1	0.0	0.0	0.0	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	38	91	53	0	39	38
Lead / Lag	Lag	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	2.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	Yes	Yes		No	No
Pedestrian Recall	No	No	No		Yes	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.50	8.10	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.50	6.10	0.00	0.00	0.00
g_i, Effective Green Time [s]	25	87	63	33	63
g / C, Green / Cycle	0.19	0.67	0.49	0.25	0.48
(v / s)_i Volume / Saturation Flow Rate	0.17	0.32	0.23	0.09	0.32
s, saturation flow rate [veh/h]	1781	1870	1805	1781	1578
c, Capacity [veh/h]	347	1247	874	455	735
d1, Uniform Delay [s]	50.89	10.64	22.38	39.64	27.28
k, delay calibration	0.20	0.50	0.50	0.04	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	12.69	1.34	1.81	0.18	5.28
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.88	0.48	0.47	0.36	0.69
d, Delay for Lane Group [s/veh]	63.57	11.98	24.19	39.81	32.56
Lane Group LOS	E	B	C	D	C
Critical Lane Group	No	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	10.82	8.36	8.68	4.30	13.35
50th-Percentile Queue Length [ft/ln]	270.44	209.03	216.99	107.60	333.79
95th-Percentile Queue Length [veh/ln]	16.21	13.10	13.51	7.71	19.34
95th-Percentile Queue Length [ft/ln]	405.29	327.59	337.78	192.66	483.61

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	63.57	11.98	24.19	24.19	39.81	32.56
Movement LOS	E	B	C	C	D	C
d_A, Approach Delay [s/veh]	29.37		24.19		34.31	
Approach LOS	C		C		C	
d_I, Intersection Delay [s/veh]	29.96					
Intersection LOS	C					
Intersection V/C	0.472					

Emissions

Vehicle Miles Traveled [mph]	29.32	57.67	9.74	3.83	12.02
Stops [stops/h]	299.56	231.54	240.35	119.19	369.74
Fuel consumption [US gal/h]	7.33	5.41	4.20	2.13	5.90
CO [g/h]	512.27	377.96	293.72	148.80	412.63
NOx [g/h]	99.67	73.54	57.15	28.95	80.28
VOC [g/h]	118.72	87.60	68.07	34.48	95.63

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.649	0.000	2.297
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1331	746	531
d_b, Bicycle Delay [s]	7.29	25.57	35.13
l_b,int, Bicycle LOS Score for Intersection	3.058	2.238	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	26.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.512

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	2	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Base Volume Input [veh/h]	1	667	125	319	507	1	19	17	9	68	1	190
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	667	125	319	507	1	19	17	9	68	1	190
Peak Hour Factor	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	169	32	81	129	0	5	4	2	17	0	48
Total Analysis Volume [veh/h]	1	677	127	324	514	1	19	17	9	69	1	193
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			1			0		
v_co, Outbound Pedestrian Volume crossing	5			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	11			2			0			8		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	10	35	35	10	50	0	35	35	35	50	35	50
Amber [s]	3.5	3.5	3.5	3.5	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.5	6.1	0.0	0.0	0.0	0.0	6.1	0.0	6.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	10	53	38	39	82	0	53	38	53	82	38	82
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	2.0	3.0	3.0	3.0	2.5	0.0	3.0	3.0	3.0	2.5	3.0	2.5
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	No			No			No	
Pedestrian Recall	No	No		Yes	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
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Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	130	130	130	130	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.50	8.10	8.10	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.50	6.10	6.10	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	3	76	76	27	95	95	21	21	21	21
g / C, Green / Cycle	0.02	0.58	0.58	0.21	0.73	0.73	0.16	0.16	0.16	0.16
(v / s)_i Volume / Saturation Flow Rate	0.00	0.19	0.08	0.18	0.14	0.14	0.02	0.01	0.06	0.12
s, saturation flow rate [veh/h]	1781	3560	1540	1781	1870	1869	1189	1761	1182	1553
c, Capacity [veh/h]	38	2068	895	376	1360	1359	159	279	242	246
d1, Uniform Delay [s]	62.30	14.10	12.41	49.48	5.60	5.60	55.02	46.75	51.23	52.43
k, delay calibration	0.04	0.50	0.50	0.25	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.10	0.42	0.33	12.34	0.31	0.31	0.33	0.14	0.65	5.50
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.03	0.33	0.14	0.86	0.19	0.19	0.12	0.09	0.29	0.79
d, Delay for Lane Group [s/veh]	62.41	14.52	12.74	61.82	5.91	5.91	55.35	46.90	51.88	57.93
Lane Group LOS	E	B	B	E	A	A	E	D	D	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.03	5.14	1.74	11.34	2.12	2.12	0.60	0.75	2.14	6.42
50th-Percentile Queue Length [ft/ln]	0.83	128.47	43.49	283.59	52.99	52.96	15.11	18.74	53.39	160.55
95th-Percentile Queue Length [veh/ln]	0.06	8.86	3.13	16.87	3.82	3.81	1.09	1.35	3.84	10.58
95th-Percentile Queue Length [ft/ln]	1.50	221.41	78.28	421.67	95.39	95.33	27.19	33.73	96.10	264.45

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	62.41	14.52	12.74	61.82	5.91	5.91	55.35	46.90	46.90	51.88	51.88	57.93
Movement LOS	E	B	B	E	A	A	E	D	D	D	D	E
d_A, Approach Delay [s/veh]	14.30			27.50			50.47			56.32		
Approach LOS	B			C			D			E		
d_I, Intersection Delay [s/veh]	26.47											
Intersection LOS	C											
Intersection V/C	0.512											

Emissions

Vehicle Miles Traveled [mph]	0.02	16.05	3.01	31.04	24.68	24.66	1.28	1.75	1.66	4.57
Stops [stops/h]	0.92	284.61	48.17	314.13	58.70	58.66	16.73	20.75	59.14	177.84
Fuel consumption [US gal/h]	0.02	4.75	0.81	7.62	1.69	1.69	0.32	0.39	1.13	3.45
CO [g/h]	1.44	332.20	56.36	532.70	118.25	118.18	22.27	26.98	79.26	240.82
NOx [g/h]	0.28	64.63	10.97	103.64	23.01	22.99	4.33	5.25	15.42	46.86
VOC [g/h]	0.33	76.99	13.06	123.46	27.41	27.39	5.16	6.25	18.37	55.81

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.937	2.738	1.968	2.195
Crosswalk LOS	C	B	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	746	1192	515	515
d_b, Bicycle Delay [s]	25.69	10.61	35.82	35.96
l_b,int, Bicycle LOS Score for Intersection	2.224	2.252	1.634	1.994
Bicycle LOS	B	B	A	A

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Generated with PTV VISTRO
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Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	53.1
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.600

Intersection Setup

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Base Volume Input [veh/h]	71	376	294	195	304	3	31	230	156	353	63	304
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	71	376	294	195	304	3	31	230	156	353	63	304
Peak Hour Factor	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	98	77	51	79	1	8	60	41	92	16	79
Total Analysis Volume [veh/h]	74	392	307	204	317	3	32	240	163	368	66	317
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	8			5			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			8			5		
v_co, Outbound Pedestrian Volume crossing	4			1			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			1			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			2			16			11		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	45	0	30	30	30	0	40	0	45	45	45
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	38	0	29	29	29	0	40	0	34	34	34
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	0	5	0	5	5	5
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	141	141	141	141	141	141	141	141	141	141	141	141	141
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	23	23	23	23	17	17	17	22	22	22	61	61	61
g / C, Green / Cycle	0.16	0.16	0.16	0.16	0.12	0.12	0.12	0.15	0.15	0.15	0.43	0.43	0.43
(v / s)_i Volume / Saturation Flow Rate	0.04	0.13	0.14	0.14	0.10	0.10	0.10	0.02	0.13	0.11	0.12	0.12	0.20
s, saturation flow rate [veh/h]	1781	1870	1725	1543	1781	1853	1863	1781	1870	1510	1781	1807	1561
c, Capacity [veh/h]	288	302	279	249	213	222	223	274	288	232	774	785	678
d1, Uniform Delay [s]	51.70	57.21	57.35	57.26	60.44	60.39	60.39	51.40	57.90	56.24	25.66	25.65	28.17
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.47	5.77	6.75	8.35	6.86	6.38	6.32	0.19	6.27	3.82	0.90	0.88	2.31
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.26	0.83	0.84	0.86	0.80	0.80	0.79	0.12	0.83	0.70	0.28	0.28	0.47
d, Delay for Lane Group [s/veh]	52.17	62.97	64.10	65.62	67.30	66.77	66.71	51.58	64.17	60.06	26.56	26.53	30.48
Lane Group LOS	D	E	E	E	E	E	E	D	E	E	C	C	C
Critical Lane Group	No	No	No	Yes	Yes	No	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.35	9.14	8.66	7.99	6.37	6.55	6.57	1.00	8.83	5.74	4.98	5.02	8.15
50th-Percentile Queue Length [ft/ln]	58.75	228.5	216.4	199.7	159.37	163.63	164.37	25.01	220.83	143.58	124.46	125.61	203.70
95th-Percentile Queue Length [veh/ln]	4.23	14.10	13.48	12.63	10.52	10.74	10.78	1.80	13.71	9.67	8.64	8.70	12.83
95th-Percentile Queue Length [ft/ln]	105.7	352.4	337.0	315.6	262.89	268.52	269.50	45.02	342.69	241.83	215.94	217.51	320.73

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	52.17	63.38	65.23	67.23	66.74	66.71	51.58	64.17	60.06	26.55	26.53	30.48
Movement LOS	D	E	E	E	E	E	D	E	E	C	C	C
d_A, Approach Delay [s/veh]	63.01			66.92			61.70			28.21		
Approach LOS	E			E			E			C		
d_I, Intersection Delay [s/veh]	53.08											
Intersection LOS	D											
Intersection V/C	0.600											

Emissions

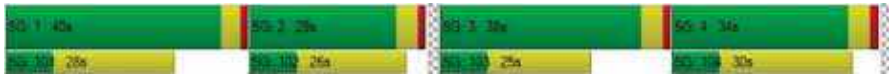
Vehicle Miles Traveled [mph]	1.75	5.93	5.56	5.08	4.05	4.18	4.20	0.76	5.68	3.86	91.78	92.73	134.77
Stops [stops/h]	60.00	233.3	221.0	204.0	162.76	167.11	167.86	25.54	225.53	146.63	127.11	128.28	208.03
Fuel consumption [US gal/h]	1.19	4.74	4.51	4.19	3.40	3.49	3.50	0.51	4.61	2.96	5.78	5.84	8.82
CO [g/h]	83.12	331.3	315.2	293.2	237.97	243.86	244.91	35.52	322.50	206.98	404.14	408.20	616.84
NOx [g/h]	16.17	64.48	61.33	57.05	46.30	47.45	47.65	6.91	62.75	40.27	78.63	79.42	120.01
VOC [g/h]	19.26	76.80	73.06	67.96	55.15	56.52	56.76	8.23	74.74	47.97	93.66	94.60	142.96

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.01	59.01	59.01	59.01
I_p,int, Pedestrian LOS Score for Intersectio	4.322	2.567	2.293	2.727
Crosswalk LOS	E	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	472	345	506	416
d_b, Bicycle Delay [s]	41.21	48.34	39.64	44.49
I_b,int, Bicycle LOS Score for Intersection	3.022	1.992	2.277	2.799
Bicycle LOS	C	A	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	11.8
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.637

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	57	39	125	30	32	7	3	776	26	42	692	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	57	39	125	30	32	7	3	776	26	42	692	8
Peak Hour Factor	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	10	34	8	9	2	1	209	7	11	186	2
Total Analysis Volume [veh/h]	61	42	134	32	34	8	3	835	28	45	744	9
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	5			1			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			5			1		
v_co, Outbound Pedestrian Volume crossing	6			5			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			5			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			13			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	69
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	47	0	47	47	47	23	23	23	23	23	23
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	70	70	70	70	70	70	70	70
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	14	14	14	14	48	48	48	48
g / C, Green / Cycle	0.20	0.20	0.20	0.20	0.68	0.68	0.68	0.68
(v / s)_i Volume / Saturation Flow Rate	0.05	0.11	0.03	0.02	0.00	0.46	0.07	0.40
s, saturation flow rate [veh/h]	1351	1620	1203	1795	710	1857	641	1865
c, Capacity [veh/h]	303	328	186	363	423	1264	354	1269
d1, Uniform Delay [s]	26.61	24.98	31.18	22.80	10.62	6.68	13.92	5.99
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.32	1.37	0.44	0.14	0.03	3.00	0.74	2.05
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.20	0.54	0.17	0.12	0.01	0.68	0.13	0.59
d, Delay for Lane Group [s/veh]	26.93	26.34	31.61	22.94	10.65	9.68	14.66	8.04
Lane Group LOS	C	C	C	C	B	A	B	A
Critical Lane Group	No	Yes	No	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.91	2.66	0.53	0.57	0.03	6.83	0.52	5.24
50th-Percentile Queue Length [ft/ln]	22.85	66.41	13.24	14.14	0.70	170.75	12.94	131.11
95th-Percentile Queue Length [veh/ln]	1.65	4.78	0.95	1.02	0.05	11.12	0.93	9.00
95th-Percentile Queue Length [ft/ln]	41.13	119.54	23.82	25.45	1.25	277.91	23.29	225.01

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.93	26.34	26.34	31.61	22.94	22.94	10.65	9.68	9.68	14.66	8.04	8.04
Movement LOS	C	C	C	C	C	C	B	A	A	B	A	A
d_A, Approach Delay [s/veh]		26.50			26.69			9.69			8.41	
Approach LOS		C			C			A			A	
d_I, Intersection Delay [s/veh]	11.83											
Intersection LOS	B											
Intersection V/C	0.637											

Emissions

Vehicle Miles Traveled [mph]	4.29	12.37	2.77	3.64	1.28	366.90	4.51	75.46
Stops [stops/h]	47.01	136.61	27.23	29.09	1.43	351.27	26.62	269.72
Fuel consumption [US gal/h]	0.71	2.02	0.43	0.47	0.07	19.55	0.44	5.66
CO [g/h]	49.46	141.48	30.40	32.94	4.85	1366.36	30.70	395.63
NOx [g/h]	9.62	27.53	5.91	6.41	0.94	265.84	5.97	76.98
VOC [g/h]	11.46	32.79	7.05	7.63	1.12	316.67	7.11	91.69

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.86	24.86	24.86	24.86
l_p,int, Pedestrian LOS Score for Intersectio	2.084	1.965	2.468	2.528
Crosswalk LOS	B	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1226	1226	540	540
d_b, Bicycle Delay [s]	5.25	5.25	18.77	18.69
l_b,int, Bicycle LOS Score for Intersection	1.951	1.682	2.989	2.876
Bicycle LOS	A	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	11.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.672

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	4	0	8	129	3	19	9	917	1	2	733	120
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	0	8	129	3	19	9	917	1	2	733	120
Peak Hour Factor	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	0	2	34	1	5	2	244	0	1	195	32
Total Analysis Volume [veh/h]	4	0	9	137	3	20	10	975	1	2	779	128
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			10		
v_co, Outbound Pedestrian Volume crossing	21			11			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			21			11		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			9			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	80.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	30	0	30	30	30	90	90	90	90	90	90
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	16	16	96	96	96	96
g / C, Green / Cycle	0.13	0.13	0.80	0.80	0.80	0.80
(v / s)_i Volume / Saturation Flow Rate	0.01	0.11	0.02	0.52	0.00	0.50
s, saturation flow rate [veh/h]	1699	1444	615	1870	576	1816
c, Capacity [veh/h]	269	251	411	1489	377	1446
d1, Uniform Delay [s]	45.24	50.16	11.26	5.20	12.18	4.97
k, delay calibration	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	2.68	0.11	2.27	0.03	2.07
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.05	0.64	0.02	0.66	0.01	0.63
d, Delay for Lane Group [s/veh]	45.31	52.84	11.37	7.47	12.20	7.04
Lane Group LOS	D	D	B	A	B	A
Critical Lane Group	No	Yes	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.35	4.85	0.13	9.33	0.03	7.87
50th-Percentile Queue Length [ft/ln]	8.72	121.23	3.27	233.16	0.67	196.64
95th-Percentile Queue Length [veh/ln]	0.63	8.46	0.24	14.33	0.05	12.47
95th-Percentile Queue Length [ft/ln]	15.69	211.51	5.89	358.37	1.21	311.63

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	45.31	45.31	45.31	52.84	52.84	52.84	11.37	7.47	7.47	12.20	7.04	7.04
Movement LOS	D	D	D	D	D	D	B	A	A	B	A	A
d_A, Approach Delay [s/veh]	45.31			52.84			7.51			7.05		
Approach LOS	D			D			A			A		
d_I, Intersection Delay [s/veh]	11.05											
Intersection LOS	B											
Intersection V/C	0.672											

Emissions

Vehicle Miles Traveled [mph]	0.37	3.80	1.00	97.80	0.05	21.45
Stops [stops/h]	10.46	145.47	3.93	279.79	0.81	235.97
Fuel consumption [US gal/h]	0.18	2.68	0.08	6.96	0.01	3.49
CO [g/h]	12.35	187.35	5.82	486.16	0.80	243.63
NOx [g/h]	2.40	36.45	1.13	94.59	0.15	47.40
VOC [g/h]	2.86	43.42	1.35	112.67	0.18	56.46

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
l_p,int, Pedestrian LOS Score for Intersectio	1.739	1.888	2.444	2.809
Crosswalk LOS	A	A	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	432	432	1432	1432
d_b, Bicycle Delay [s]	36.91	36.91	4.87	4.85
l_b,int, Bicycle LOS Score for Intersection	1.581	1.824	3.187	3.059
Bicycle LOS	A	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	14.8
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.591

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	39	1	85	49	1	10	3	1098	12	33	813	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	39	1	85	49	1	10	3	1098	12	33	813	17
Peak Hour Factor	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	0	22	12	0	3	1	279	3	8	207	4
Total Analysis Volume [veh/h]	40	1	87	50	1	10	3	1118	12	34	828	17
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	11			2			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			11			2		
v_co, Outbound Pedestrian Volume crossing	13			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			13		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			8			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	65	65	65	65	65	65	65	65	65	65
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	7	7	3	3	3	0	35	35	2	37
g / C, Green / Cycle	0.11	0.11	0.05	0.05	0.05	0.00	0.54	0.54	0.03	0.56
(v / s)_i Volume / Saturation Flow Rate	0.02	0.06	0.01	0.01	0.01	0.00	0.30	0.30	0.02	0.45
s, saturation flow rate [veh/h]	1781	1516	1781	1784	1541	1781	1870	1861	1781	1862
c, Capacity [veh/h]	197	168	88	88	76	6	1003	998	51	1046
d1, Uniform Delay [s]	26.46	27.46	30.00	30.00	29.76	32.56	10.09	10.09	31.49	11.52
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.23	0.11	0.23
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.50	2.51	1.80	1.79	0.77	55.92	1.07	1.08	14.41	3.23
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.20	0.52	0.29	0.29	0.13	0.51	0.56	0.56	0.67	0.81
d, Delay for Lane Group [s/veh]	26.96	29.97	31.80	31.79	30.53	88.48	11.16	11.17	45.90	14.75
Lane Group LOS	C	C	C	C	C	F	B	B	D	B
Critical Lane Group	No	Yes	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.58	1.38	0.44	0.44	0.17	0.14	4.97	4.96	0.72	9.14
50th-Percentile Queue Length [ft/ln]	14.47	34.41	10.97	10.97	4.25	3.43	124.31	123.95	18.03	228.58
95th-Percentile Queue Length [veh/ln]	1.04	2.48	0.79	0.79	0.31	0.25	8.63	8.61	1.30	14.10
95th-Percentile Queue Length [ft/ln]	26.05	61.94	19.74	19.75	7.65	6.17	215.73	215.24	32.46	352.55

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.96	29.97	29.97	31.79	31.79	30.53	88.48	11.16	11.17	45.90	14.75	14.75
Movement LOS	C	C	C	C	C	C	F	B	B	D	B	B
d_A, Approach Delay [s/veh]		29.03			31.59			11.37			15.96	
Approach LOS		C			C			B			B	
d_I, Intersection Delay [s/veh]	14.79											
Intersection LOS	B											
Intersection V/C	0.591											

Emissions

Vehicle Miles Traveled [mph]	1.82	3.99	0.85	0.85	0.33	0.07	13.38	13.33	4.26	105.89
Stops [stops/h]	31.91	75.86	24.18	24.19	9.37	7.56	274.03	273.25	39.75	503.91
Fuel consumption [US gal/h]	0.42	1.01	0.23	0.23	0.09	0.09	2.94	2.93	0.66	9.23
CO [g/h]	29.60	70.42	16.17	16.18	6.16	6.03	205.39	204.79	46.25	645.34
NOx [g/h]	5.76	13.70	3.15	3.15	1.20	1.17	39.96	39.85	9.00	125.56
VOC [g/h]	6.86	16.32	3.75	3.75	1.43	1.40	47.60	47.46	10.72	149.56

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	22.59	22.59	22.59	22.59
l_p,int, Pedestrian LOS Score for Intersectio	1.970	2.120	2.522	2.724
Crosswalk LOS	A	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	919	919	612	612
d_b, Bicycle Delay [s]	9.55	9.55	15.79	15.75
l_b,int, Bicycle LOS Score for Intersection	1.771	1.660	2.494	3.010
Bicycle LOS	A	A	B	C

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	13.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.831

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	462	34	19	1374	917	214
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	462	34	19	1374	917	214
Peak Hour Factor	0.9590	0.9590	0.9590	0.9590	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	120	9	5	358	239	56
Total Analysis Volume [veh/h]	482	35	20	1433	956	223
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	2		0		1	
v_ci, Inbound Pedestrian Volume crossing mi	1		0		2	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	3		10		6	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	31	31
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	40	13	100	87	87
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	58	58	58	58	58	58
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	18	18	1	31	26	26
g / C, Green / Cycle	0.30	0.30	0.02	0.53	0.45	0.45
(v / s)_i Volume / Saturation Flow Rate	0.27	0.02	0.01	0.40	0.27	0.14
s, saturation flow rate [veh/h]	1781	1567	1781	3560	3560	1550
c, Capacity [veh/h]	542	477	34	1882	1598	696
d1, Uniform Delay [s]	19.24	14.35	28.21	10.79	12.04	10.25
k, delay calibration	0.04	0.04	0.04	0.15	0.15	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.06	0.02	5.70	0.93	0.51	0.38
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.89	0.07	0.58	0.76	0.60	0.32
d, Delay for Lane Group [s/veh]	21.30	14.38	33.91	11.72	12.56	10.62
Lane Group LOS	C	B	C	B	B	B
Critical Lane Group	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	5.80	0.30	0.31	5.87	3.87	1.56
50th-Percentile Queue Length [ft/ln]	144.94	7.51	7.87	146.74	96.72	39.07
95th-Percentile Queue Length [veh/ln]	9.75	0.54	0.57	9.84	6.96	2.81
95th-Percentile Queue Length [ft/ln]	243.66	13.52	14.17	246.07	174.09	70.33

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	21.30	14.38	33.91	11.72	12.56	10.62
Movement LOS	C	B	C	B	B	B
d_A, Approach Delay [s/veh]	20.83		12.03		12.19	
Approach LOS	C		B		B	
d_I, Intersection Delay [s/veh]	13.53					
Intersection LOS	B					
Intersection V/C	0.831					

Emissions

Vehicle Miles Traveled [mph]	11.41	0.83	2.51	179.58	22.62	5.28
Stops [stops/h]	360.79	18.69	19.59	730.54	481.51	97.26
Fuel consumption [US gal/h]	4.55	0.24	0.35	14.85	6.93	1.41
CO [g/h]	318.25	16.76	24.43	1037.87	484.18	98.89
NOx [g/h]	61.92	3.26	4.75	201.93	94.20	19.24
VOC [g/h]	73.76	3.88	5.66	240.54	112.21	22.92

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	18.97	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.163	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1238	3267	2818
d_b, Bicycle Delay [s]	4.21	11.67	4.85
l_b,int, Bicycle LOS Score for Intersection	1.560	2.758	2.532
Bicycle LOS	A	C	B

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	17.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.696

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	516	0	320	0	1416	359	0	845	694	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	516	0	320	0	1416	359	0	845	694	0	0	0
Peak Hour Factor	0.9624	1.0000	0.9624	1.0000	0.9624	0.9624	1.0000	0.9624	0.9624	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	134	0	83	0	368	93	0	220	180	0	0	0
Total Analysis Volume [veh/h]	536	0	333	0	1471	373	0	878	721	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			14			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			14		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			5			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	33	0	0	0	112	0	0	112	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	5	0	0	5	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				Yes			Yes				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	145	145	145	145	145	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
I2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	25	25	112	112	112	
g / C, Green / Cycle	0.18	0.18	0.77	0.77	0.77	
(v / s)_i Volume / Saturation Flow Rate	0.15	0.12	0.29	0.17	0.46	
s, saturation flow rate [veh/h]	3459	2813	5094	5094	1554	
c, Capacity [veh/h]	607	494	3919	3919	1195	
d1, Uniform Delay [s]	58.32	55.89	5.43	4.66	7.06	
k, delay calibration	0.11	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	4.45	1.61	0.28	0.13	2.26	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.88	0.67	0.38	0.22	0.60	
d, Delay for Lane Group [s/veh]	62.76	57.51	5.70	4.80	9.32	
Lane Group LOS	E	E	A	A	A	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	10.00	5.84	4.51	2.31	9.18	
50th-Percentile Queue Length [ft/ln]	249.95	146.02	112.64	57.69	229.57	
95th-Percentile Queue Length [veh/ln]	15.18	9.80	7.99	4.15	14.15	
95th-Percentile Queue Length [ft/ln]	379.59	245.10	199.67	103.85	353.81	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	62.76	0.00	57.51	0.00	5.70	0.00	0.00	4.80	9.32	0.00	0.00	0.00
Movement LOS	E		E		A			A	A			
d_A, Approach Delay [s/veh]	60.75			4.58			6.84			0.00		
Approach LOS	E			A			A			A		
d_I, Intersection Delay [s/veh]	17.89											
Intersection LOS	B											
Intersection V/C	0.696											

Emissions

Vehicle Miles Traveled [mph]	12.70	7.89	34.79	97.30	79.90	
Stops [stops/h]	496.45	290.02	335.59	171.89	227.99	
Fuel consumption [US gal/h]	10.11	5.82	4.99	5.81	5.92	
CO [g/h]	706.74	407.06	349.04	406.27	413.60	
NOx [g/h]	137.51	79.20	67.91	79.05	80.47	
VOC [g/h]	163.79	94.34	80.89	94.16	95.86	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	63.78	0.00	63.78
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.991	0.000	1.447
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	400	1490	1490	0
d_b, Bicycle Delay [s]	46.40	4.72	4.73	72.50
l_b,int, Bicycle LOS Score for Intersection	1.560	2.369	2.439	4.132
Bicycle LOS	A	B	B	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	34.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.529

Intersection Setup

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	200.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	270	0	964	0	0	0	0	1623	385	0	1101	313
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	270	0	964	0	0	0	0	1623	385	0	1101	313
Peak Hour Factor	0.9741	1.0000	0.9741	1.0000	1.0000	1.0000	1.0000	0.9741	0.9741	1.0000	0.9741	0.9741
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	69	0	247	0	0	0	0	417	99	0	283	80
Total Analysis Volume [veh/h]	277	0	990	0	0	0	0	1666	395	0	1130	321
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	2.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	7	0	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	30	0	0	16	0	0	16	0
Amber [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	5	0	5	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	10	0	10	0	10	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No			No	
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	25	0	25	0	25	0	0	95	0	0	95	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	5	0	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No		No			No			No	
Maximum Recall	No		No		No			No			No	
Pedestrian Recall	No		No		No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	R	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	21	46	21	91	91	116	91
g / C, Green / Cycle	0.14	0.32	0.14	0.63	0.63	0.80	0.63
(v / s)_i Volume / Saturation Flow Rate	0.10	0.35	0.00	0.33	0.25	0.22	0.20
s, saturation flow rate [veh/h]	2752	2813	1870	5094	1589	5094	1589
c, Capacity [veh/h]	410	893	296	3197	998	4075	998
d1, Uniform Delay [s]	59.04	49.50	0.00	14.94	13.38	3.73	12.60
k, delay calibration	0.11	0.34	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.94	60.50	0.00	0.61	1.18	0.17	0.85
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.68	1.11	0.00	0.52	0.40	0.28	0.32
d, Delay for Lane Group [s/veh]	60.98	110.00	0.00	15.55	14.56	3.90	13.45
Lane Group LOS	E	F	A	B	B	A	B
Critical Lane Group	No	Yes	No	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	4.98	23.59	0.00	10.18	6.69	2.57	5.11
50th-Percentile Queue Length [ft/ln]	124.38	589.71	0.00	254.48	167.37	64.18	127.75
95th-Percentile Queue Length [veh/ln]	8.63	33.69	0.00	15.41	10.94	4.62	8.82
95th-Percentile Queue Length [ft/ln]	215.83	842.37	0.00	385.29	273.45	115.52	220.43

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	60.98	0.00	110.00	0.00	0.00	0.00	0.00	15.55	14.56	0.00	3.90	13.45
Movement LOS	E		F	A	A	A		B	B		A	B
d_A, Approach Delay [s/veh]	99.28			0.00			15.36			6.01		
Approach LOS	F			A			B			A		
d_I, Intersection Delay [s/veh]	34.77											
Intersection LOS	C											
Intersection V/C	0.529											

Emissions

Vehicle Miles Traveled [mph]	7.18	25.66	0.00	184.63	43.77	26.71	7.59
Stops [stops/h]	247.04	1171.30	0.00	758.18	166.21	191.20	126.87
Fuel consumption [US gal/h]	5.10	29.68	0.00	17.06	3.89	3.05	1.89
CO [g/h]	356.32	2074.95	0.00	1192.66	271.95	213.33	132.26
NOx [g/h]	69.33	403.71	0.00	232.05	52.91	41.51	25.73
VOC [g/h]	82.58	480.89	0.00	276.41	63.03	49.44	30.65

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	9.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.78	63.78	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.648	1.895	0.000	0.000
Crosswalk LOS	B	A	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	290	290	1255	1600
d_b, Bicycle Delay [s]	53.02	53.02	10.06	2.90
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.693	2.358
Bicycle LOS	A	A	B	B

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.AM.vistro Scenario 18 Near-Term AM
Report File: C:\...\N AM.pdf 2/4/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road and US 101 NB Ramps	Signalized	HCM 7th Edition	WB Right	0.952	22.6	C
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	EB Left	0.924	43.4	D
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	NB Left	0.713	19.1	B
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	SB Left	0.700	30.9	C
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	SB Left	0.656	19.3	B
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	NB Left	0.623	46.2	D
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	EB Right	0.733	46.7	D
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	NB Left	0.804	34.6	C
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	NB Left	0.525	27.5	C
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	EB Thru	0.729	58.1	E
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	SB Left	0.622	10.6	B
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.646	9.0	A
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	EB Left	0.892	39.9	D
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	WB Right	1.080	68.0	E
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	1.901	119.2	F
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	0.740	44.1	D

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V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road and US 101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	22.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.952

Intersection Setup

Name	Marsh Road (SR 84)		Marsh Road		US 101 NB Off-Ramp	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

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Volumes

Name	Marsh Road (SR 84)		Marsh Road		US 101 NB Off-Ramp	
Base Volume Input [veh/h]	1573	0	0	767	719	636
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	474	0	0	166	0	134
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2047	0	0	933	719	770
Peak Hour Factor	0.9670	1.0000	1.0000	0.9670	0.9670	0.9670
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	529	0	0	241	186	199
Total Analysis Volume [veh/h]	2117	0	0	965	744	796
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	1		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	2		0		1	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	1		1		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	60	0	0	60	60	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	30	0	0	30	60	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	No	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	57	57	28	28
g / C, Green / Cycle	0.63	0.63	0.32	0.32
(v / s)_i Volume / Saturation Flow Rate	0.59	0.27	0.22	0.28
s, saturation flow rate [veh/h]	3560	3560	3459	2813
c, Capacity [veh/h]	2253	2253	1097	892
d1, Uniform Delay [s]	14.97	8.32	26.73	29.26
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.27	0.60	0.28	1.30
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.94	0.43	0.68	0.89
d, Delay for Lane Group [s/veh]	24.24	8.92	27.00	30.55
Lane Group LOS	C	A	C	C
Critical Lane Group	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	19.30	4.34	6.77	8.04
50th-Percentile Queue Length [ft/ln]	482.60	108.62	169.30	201.05
95th-Percentile Queue Length [veh/ln]	26.51	7.76	11.04	12.69
95th-Percentile Queue Length [ft/ln]	662.74	194.09	276.00	317.32

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	24.24	0.00	0.00	8.92	27.00	30.55
Movement LOS	C			A	C	C
d_A, Approach Delay [s/veh]	24.24		8.92		28.84	
Approach LOS	C		A		C	
d_I, Intersection Delay [s/veh]	22.58					
Intersection LOS	C					
Intersection V/C	0.952					

Emissions

Vehicle Miles Traveled [mph]	165.36	22.81	17.53	18.75
Stops [stops/h]	1544.32	347.59	541.76	643.36
Fuel consumption [US gal/h]	25.78	4.61	7.80	9.28
CO [g/h]	1802.31	322.37	545.44	648.35
NOx [g/h]	350.66	62.72	106.12	126.15
VOC [g/h]	417.70	74.71	126.41	150.26

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	36.45	34.67
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.078	2.506
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	564	564	1240
d_b, Bicycle Delay [s]	23.20	23.20	6.50
l_b,int, Bicycle LOS Score for Intersection	3.306	2.356	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	43.4
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.924

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	889	1387	217	1109	424
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	218	89	0	284	76
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1107	1476	217	1393	500
Peak Hour Factor	1.0000	0.9590	0.9590	1.0000	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	289	385	54	363	130
Total Analysis Volume [veh/h]	0	1154	1539	217	1453	521
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1		0		2	
v_di, Inbound Pedestrian Volume crossing m	2		0		1	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	2		1		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	60	60	0	35	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	10	0	5	0
Pedestrian Clearance [s]	0	16	0	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	55	55	0	35	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	53	50	33	33
g / C, Green / Cycle	0.58	0.56	0.37	0.37
(v / s)_i Volume / Saturation Flow Rate	0.29	0.43	0.42	0.33
s, saturation flow rate [veh/h]	4000	3560	3459	1586
c, Capacity [veh/h]	2333	1994	1268	581
d1, Uniform Delay [s]	10.98	15.34	28.50	26.85
k, delay calibration	0.50	0.50	0.08	0.36
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.75	2.97	67.27	14.56
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.49	0.77	1.15	0.90
d, Delay for Lane Group [s/veh]	11.73	18.31	95.77	41.41
Lane Group LOS	B	B	F	D
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	6.17	11.51	24.81	12.39
50th-Percentile Queue Length [ft/ln]	154.22	287.87	620.32	309.68
95th-Percentile Queue Length [veh/ln]	10.24	17.08	36.03	18.16
95th-Percentile Queue Length [ft/ln]	256.05	427.00	900.66	453.98

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	11.73	18.31	0.00	95.77	41.41
Movement LOS		B	B		F	D
d_A, Approach Delay [s/veh]	11.73		18.31		81.42	
Approach LOS	B		B		F	
d_I, Intersection Delay [s/veh]	43.38					
Intersection LOS	D					
Intersection V/C	0.924					

Emissions

Vehicle Miles Traveled [mph]	144.34	138.49	34.36	12.32
Stops [stops/h]	493.49	921.19	1985.01	495.49
Fuel consumption [US gal/h]	11.97	17.94	40.70	7.63
CO [g/h]	836.61	1254.19	2844.62	533.68
NOx [g/h]	162.77	244.02	553.46	103.83
VOC [g/h]	193.89	290.67	659.27	123.69

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.45	0.00	32.09
l_p,int, Pedestrian LOS Score for Intersectio	3.033	0.000	2.609
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1120	1120	687
d_b, Bicycle Delay [s]	8.72	8.72	19.40
l_b,int, Bicycle LOS Score for Intersection	2.512	2.829	1.560
Bicycle LOS	B	C	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	19.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.713

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	1	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	1	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			30.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Base Volume Input [veh/h]	24	1304	9	212	1247	352	237	8	1	15	3	64
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	218	0	0	165	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	24	1522	9	212	1412	352	237	8	1	15	3	64
Peak Hour Factor	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	399	2	56	370	92	62	2	0	4	1	17
Total Analysis Volume [veh/h]	25	1595	9	222	1480	369	248	8	1	16	3	67
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			0			1			0		
v_di, Inbound Pedestrian Volume crossing m	1			0			2			0		
v_co, Outbound Pedestrian Volume crossing	2			0			0			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			0			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	135
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	4	4	8	3	8
Auxiliary Signal Groups												
Maximum Green [s]	15	60	60	20	65	65	40	40	40	0	40	0
Amber [s]	3.0	4.0	4.0	3.0	4.0	4.0	3.2	3.2	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	8	8	8	0	8	0
Pedestrian Clearance [s]	0	21	21	0	21	21	24	24	24	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	85	85	14	79	79	20	20	20	0	16	0
Lead / Lag	Lead	-	-	Lead	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	10	10	4	10	10	4	4	4	0	6	0
Vehicle Extension [s]	2.5	3.5	3.5	2.0	3.5	3.5	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	135	135	135	135	135	135	135	135	135	135
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	4.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	4	92	92	10	100	100	15	15	8	8
g / C, Green / Cycle	0.03	0.68	0.68	0.07	0.74	0.74	0.11	0.11	0.06	0.06
(v / s)_i Volume / Saturation Flow Rate	0.01	0.30	0.30	0.06	0.49	0.53	0.07	0.07	0.01	0.02
s, saturation flow rate [veh/h]	1781	3560	1865	3459	1870	1747	1781	1785	1794	2813
c, Capacity [veh/h]	60	2427	1271	256	1378	1287	198	198	106	167
d1, Uniform Delay [s]	63.93	9.72	9.72	61.84	9.24	9.93	57.50	57.50	60.37	61.19
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.41	0.57	1.08	3.46	2.62	3.47	2.67	2.66	0.59	1.15
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.42	0.43	0.43	0.87	0.67	0.72	0.65	0.65	0.18	0.40
d, Delay for Lane Group [s/veh]	67.34	10.28	10.80	65.30	11.86	13.40	60.17	60.16	60.96	62.34
Lane Group LOS	E	B	B	E	B	B	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.90	6.78	7.29	3.90	13.73	14.91	4.39	4.40	0.64	1.15
50th-Percentile Queue Length [ft/ln]	22.43	169.58	182.16	97.49	343.24	372.74	109.80	109.96	16.10	28.66
95th-Percentile Queue Length [veh/ln]	1.61	11.05	11.71	7.02	19.81	21.24	7.83	7.84	1.16	2.06
95th-Percentile Queue Length [ft/ln]	40.37	276.36	292.83	175.48	495.16	531.05	195.73	195.95	28.97	51.58

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	67.34	10.46	10.80	65.30	12.44	13.40	60.16	60.16	60.16	60.96	60.96	62.34
Movement LOS	E	B	B	E	B	B	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	11.33			18.28			60.16			62.03		
Approach LOS	B			B			E			E		
d_I, Intersection Delay [s/veh]	19.07											
Intersection LOS	B											
Intersection V/C	0.713											

Emissions

Vehicle Miles Traveled [mph]	5.15	216.87	113.58	27.77	115.63	115.63	3.87	3.88	1.29	4.56
Stops [stops/h]	23.92	361.77	194.31	207.98	366.12	397.59	117.12	117.29	17.17	61.14
Fuel consumption [US gal/h]	0.72	13.19	7.00	5.24	9.01	9.48	2.20	2.20	0.36	1.29
CO [g/h]	50.24	922.00	489.45	366.40	630.13	662.47	153.45	153.67	25.14	90.12
NOx [g/h]	9.78	179.39	95.23	71.29	122.60	128.89	29.86	29.90	4.89	17.53
VOC [g/h]	11.64	213.68	113.43	84.92	146.04	153.53	35.56	35.61	5.83	20.89

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.03	56.03	56.95	56.95
l_p,int, Pedestrian LOS Score for Intersectio	3.121	3.167	2.137	2.372
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1185	1096	234	175
d_b, Bicycle Delay [s]	11.20	13.78	52.65	56.22
l_b,int, Bicycle LOS Score for Intersection	2.456	3.268	1.984	1.702
Bicycle LOS	B	C	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	30.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.700

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Base Volume Input [veh/h]	104	886	41	25	976	384	462	24	145	23	19	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	218	0	0	165	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	104	1104	41	25	1141	384	462	24	145	23	19	17
Peak Hour Factor	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	290	11	7	299	101	121	6	38	6	5	4
Total Analysis Volume [veh/h]	109	1158	43	26	1197	403	485	25	152	24	20	18
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	12			2			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			12			2		
v_co, Outbound Pedestrian Volume crossing	5			2			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			2			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	155
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	20	80	80	18	72	72	35	35	35	0	35	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	58	58	15	58	58	37	45	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	155	155	155	155	155	155	155	155	155	155	155
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	13	103	103	5	95	95	28	28	28	11	11
g / C, Green / Cycle	0.08	0.66	0.66	0.03	0.61	0.61	0.18	0.18	0.18	0.07	0.07
(v / s)_i Volume / Saturation Flow Rate	0.06	0.32	0.32	0.01	0.44	0.46	0.14	0.14	0.10	0.01	0.02
s, saturation flow rate [veh/h]	1781	1870	1843	1781	1870	1712	1781	1789	1558	1781	1718
c, Capacity [veh/h]	149	1242	1224	56	1144	1047	326	328	286	124	120
d1, Uniform Delay [s]	69.29	12.92	12.94	73.78	20.81	21.48	60.32	60.31	57.17	68.00	68.60
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.56	1.36	1.39	2.21	3.86	4.82	3.04	3.02	1.14	0.56	1.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.73	0.49	0.49	0.46	0.72	0.75	0.78	0.78	0.53	0.19	0.32
d, Delay for Lane Group [s/veh]	71.84	14.28	14.34	75.99	24.67	26.31	63.36	63.33	58.31	68.55	69.72
Lane Group LOS	E	B	B	E	C	C	E	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.32	10.58	10.49	1.05	21.06	20.90	9.93	9.97	5.55	0.93	1.49
50th-Percentile Queue Length [ft/ln]	108.12	264.47	262.19	26.32	526.53	522.52	248.20	249.15	138.87	23.23	37.27
95th-Percentile Queue Length [veh/ln]	7.74	15.91	15.80	1.89	28.59	28.40	15.10	15.14	9.42	1.67	2.68
95th-Percentile Queue Length [ft/ln]	193.38	397.83	394.97	47.37	714.68	709.97	377.38	378.58	235.50	41.82	67.09

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	71.84	14.31	14.34	75.99	25.19	26.31	63.34	63.33	58.31	68.55	69.72	69.72
Movement LOS	E	B	B	E	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	19.10			26.28			62.19			69.27		
Approach LOS	B			C			E			E		
d_I, Intersection Delay [s/veh]	30.93											
Intersection LOS	C											
Intersection V/C	0.700											

Emissions

Vehicle Miles Traveled [mph]	17.11	94.78	93.73	5.36	168.84	160.79	29.46	29.58	17.59	1.35	2.14
Stops [stops/h]	100.44	245.71	243.58	24.45	489.16	485.44	230.58	231.46	129.02	21.58	34.63
Fuel consumption [US gal/h]	3.00	7.22	7.15	0.79	14.23	13.96	5.49	5.51	3.09	0.48	0.77
CO [g/h]	209.76	504.39	499.57	55.22	994.61	975.63	383.73	385.19	215.96	33.45	53.70
NOx [g/h]	40.81	98.14	97.20	10.74	193.52	189.82	74.66	74.94	42.02	6.51	10.45
VOC [g/h]	48.61	116.90	115.78	12.80	230.51	226.11	88.93	89.27	50.05	7.75	12.45

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	66.89	66.89	66.89	66.89
I_p,int, Pedestrian LOS Score for Intersectio	2.987	3.102	2.399	2.008
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	689	689	529	423
d_b, Bicycle Delay [s]	33.32	33.30	41.92	48.17
I_b,int, Bicycle LOS Score for Intersection	2.640	2.901	2.652	1.662
Bicycle LOS	B	C	B	A

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	19.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.656

Intersection Setup

Name				Marsh Road			Bay Road					
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name				Marsh Road			Bay Road					
Base Volume Input [veh/h]	0	741	62	247	819	0	99	43	1	54	20	185
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	205	0	6	159	0	0	0	0	0	0	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	946	62	253	978	0	99	43	1	54	20	198
Peak Hour Factor	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	250	16	67	258	0	26	11	0	14	5	52
Total Analysis Volume [veh/h]	0	999	65	267	1033	0	105	45	1	57	21	209
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			9			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			9		
v_co, Outbound Pedestrian Volume crossing	0			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			4			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	8.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	7	0	7	0	7	0	7	7	7	0	7	0
Pedestrian Clearance [s]	17	0	17	0	17	0	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	56	34	56	22	56	34	34	34	34	0	34	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
I2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	43	43	17	63	63	23	23
g / C, Green / Cycle	0.48	0.48	0.19	0.70	0.70	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.30	0.30	0.15	0.28	0.28	0.15	0.17
s, saturation flow rate [veh/h]	1870	1658	1781	1870	1870	1009	1646
c, Capacity [veh/h]	931	790	338	1308	1308	319	458
d1, Uniform Delay [s]	17.66	17.69	34.73	5.61	5.61	30.26	30.59
k, delay calibration	0.50	0.50	0.11	0.50	0.50	0.23	0.24
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.92	3.87	4.12	0.89	0.89	2.32	3.14
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.63	0.79	0.39	0.39	0.47	0.63
d, Delay for Lane Group [s/veh]	20.58	21.55	38.84	6.50	6.50	32.58	33.72
Lane Group LOS	C	C	D	A	A	C	C
Critical Lane Group	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	8.99	8.19	5.77	3.48	3.48	3.14	5.88
50th-Percentile Queue Length [ft/ln]	224.75	204.69	144.28	86.94	86.94	78.51	146.99
95th-Percentile Queue Length [veh/ln]	13.91	12.88	9.71	6.26	6.26	5.65	9.86
95th-Percentile Queue Length [ft/ln]	347.69	322.01	242.77	156.48	156.48	141.31	246.41

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	20.58	21.00	21.55	38.84	6.50	6.50	32.58	32.58	32.58	33.72	33.72	33.72
Movement LOS	C	C	C	D	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]	21.04			13.15			32.58			33.72		
Approach LOS	C			B			C			C		
d_I, Intersection Delay [s/veh]	19.30											
Intersection LOS	B											
Intersection V/C	0.656											

Emissions

Vehicle Miles Traveled [mph]	356.51	317.22	41.91	81.07	81.07	11.73	443.40
Stops [stops/h]	359.60	327.51	230.84	139.10	139.10	125.61	235.19
Fuel consumption [US gal/h]	19.02	17.07	5.44	4.82	4.82	2.01	21.52
CO [g/h]	1329.56	1192.91	380.53	336.93	336.93	140.54	1504.40
NOx [g/h]	258.68	232.10	74.04	65.55	65.55	27.34	292.70
VOC [g/h]	308.14	276.47	88.19	78.09	78.09	32.57	348.66

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	28.9
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	20.74
l_p,int, Pedestrian LOS Score for Intersectio	2.737	3.043	1.784	2.017
Crosswalk LOS	B	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	642	1131	651	651
d_b, Bicycle Delay [s]	20.76	8.51	20.47	20.47
l_b,int, Bicycle LOS Score for Intersection	2.437	2.632	1.809	2.033
Bicycle LOS	B	B	A	B

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



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Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	46.2
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.623

Intersection Setup

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	150	76	13	88	104	54	25	393	44	9	427	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	95	0	51	0	0	1	0	83	74	8	56	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	245	76	64	88	104	55	25	476	118	17	483	12
Peak Hour Factor	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	65	20	17	23	28	15	7	127	31	5	129	3
Total Analysis Volume [veh/h]	261	81	68	94	111	59	27	508	126	18	515	13
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			7			6		
v_di, Inbound Pedestrian Volume crossing m	7			6			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			25			16		
v_ci, Inbound Pedestrian Volume crossing mi	16			25			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	19			11			39			21		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	26	30	26	30	26	20	71	71	20	71	71
Amber [s]	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	28	28	28	28	28	28	10	44	44	10	44	44
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	5	4	4	5	5	5
Vehicle Extension [s]	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	Yes		No	Yes	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	149	149	149	149	149	149	149	149
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	0.00	2.70	0.00	2.70
g_i, Effective Green Time [s]	26	26	30	30	79	72	79	71
g / C, Green / Cycle	0.17	0.17	0.20	0.20	0.53	0.48	0.53	0.48
(v / s)_i Volume / Saturation Flow Rate	0.15	0.09	0.05	0.10	0.03	0.36	0.02	0.28
s, saturation flow rate [veh/h]	1781	1637	1781	1720	946	1782	861	1860
c, Capacity [veh/h]	310	285	358	346	389	856	299	884
d1, Uniform Delay [s]	59.66	56.01	50.32	52.89	20.14	31.28	23.07	28.67
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	23.25	6.71	1.78	4.94	0.34	5.72	0.08	2.97
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.84	0.52	0.26	0.49	0.07	0.74	0.06	0.60
d, Delay for Lane Group [s/veh]	82.90	62.72	52.10	57.83	20.48	36.99	23.15	31.64
Lane Group LOS	F	E	D	E	C	D	C	C
Critical Lane Group	Yes	No	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	11.59	5.67	3.20	6.22	0.49	19.71	0.31	14.63
50th-Percentile Queue Length [ft/ln]	289.74	141.74	80.01	155.51	12.30	492.64	7.71	365.67
95th-Percentile Queue Length [veh/ln]	17.17	9.57	5.76	10.31	0.89	26.99	0.56	20.90
95th-Percentile Queue Length [ft/ln]	429.31	239.37	144.01	257.77	22.14	674.64	13.89	522.48

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	82.90	62.72	62.72	52.10	57.83	57.83	20.48	36.99	36.99	23.15	31.64	31.64
Movement LOS	F	E	E	D	E	E	C	D	D	C	C	C
d_A, Approach Delay [s/veh]	75.57			55.79			36.32			31.36		
Approach LOS	E			E			D			C		
d_I, Intersection Delay [s/veh]	46.17											
Intersection LOS	D											
Intersection V/C	0.623											

Emissions

Vehicle Miles Traveled [mph]	149.35	85.26	2.23	4.03	6.41	150.48	3.62	106.33
Stops [stops/h]	279.57	136.77	77.20	150.06	11.87	475.36	7.44	352.84
Fuel consumption [US gal/h]	12.10	6.17	1.39	2.76	0.44	13.59	0.28	9.73
CO [g/h]	845.48	431.08	97.37	192.74	30.89	950.17	19.23	679.88
NOx [g/h]	164.50	83.87	18.94	37.50	6.01	184.87	3.74	132.28
VOC [g/h]	195.95	99.91	22.57	44.67	7.16	220.21	4.46	157.57

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	64.02	64.02	64.02	64.02
l_p,int, Pedestrian LOS Score for Intersectio	2.193	2.087	2.520	2.359
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	312	312	527	527
d_b, Bicycle Delay [s]	53.65	53.43	41.30	40.92
l_b,int, Bicycle LOS Score for Intersection	2.236	1.995	2.650	2.461
Bicycle LOS	B	A	B	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	46.7
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.733

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

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Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	91	660	236	89	1093	26	44	252	62	341	145	60
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	9	64	61	55	40	43	109	41	21	95	7	50
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	100	724	297	144	1133	69	153	293	83	436	152	110
Peak Hour Factor	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	199	82	40	311	19	42	80	23	120	42	30
Total Analysis Volume [veh/h]	110	795	326	158	1244	76	168	322	91	479	167	121
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			10			0			10		
v_di, Inbound Pedestrian Volume crossing m	0			10			0			10		
v_co, Outbound Pedestrian Volume crossing	0			11			12			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			12			11			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			3			8			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.0	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	Yes	Yes		Yes	Yes			Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes			No			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.00	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	1.00	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	17	60	60	24	67	67	24	24	29	29	29
g / C, Green / Cycle	0.11	0.40	0.40	0.16	0.45	0.45	0.16	0.16	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.06	0.22	0.21	0.09	0.35	0.05	0.16	0.16	0.14	0.09	0.08
s, saturation flow rate [veh/h]	1781	3560	1570	1781	3560	1514	1818	1756	3459	1870	1519
c, Capacity [veh/h]	202	1422	627	285	1588	675	291	281	669	362	294
d1, Uniform Delay [s]	60.09	26.28	25.69	50.40	14.80	10.92	63.00	63.00	56.65	53.59	52.82
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	10.18	1.59	3.07	7.58	3.94	0.34	55.26	59.55	6.47	4.20	4.23
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.54	0.56	0.52	0.55	0.78	0.11	1.01	1.02	0.72	0.46	0.41
d, Delay for Lane Group [s/veh]	70.26	27.87	28.76	57.97	18.74	11.26	118.26	122.55	63.12	57.79	57.06
Lane Group LOS	E	C	C	E	B	B	F	F	E	E	E
Critical Lane Group	Yes	No	No	No	Yes	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	4.36	8.99	7.41	5.37	9.07	0.78	15.59	15.39	9.14	6.06	4.37
50th-Percentile Queue Length [ft/ln]	108.94	224.84	185.37	134.19	226.86	19.56	389.65	384.80	228.58	151.41	109.23
95th-Percentile Queue Length [veh/ln]	7.78	13.91	11.88	9.17	14.01	1.41	22.17	22.07	14.10	10.09	7.80
95th-Percentile Queue Length [ft/ln]	194.53	347.80	297.01	229.18	350.37	35.21	554.29	551.86	352.55	252.31	194.93

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	70.26	27.87	28.76	57.97	18.74	11.26	118.26	120.87	122.55	63.12	57.79	57.06
Movement LOS	E	C	C	E	B	B	F	F	F	E	E	E
d_A, Approach Delay [s/veh]		31.89			22.55			120.38			61.00	
Approach LOS		C			C			F			E	
d_I, Intersection Delay [s/veh]	46.66											
Intersection LOS	D											
Intersection V/C	0.733											

Emissions

Vehicle Miles Traveled [mph]	2.61	18.85	7.73	3.75	29.49	1.80	6.95	6.80	113.69	39.64	28.72
Stops [stops/h]	104.58	431.70	177.95	128.82	435.57	18.78	374.07	369.41	438.87	145.36	104.86
Fuel consumption [US gal/h]	2.46	8.47	3.54	2.98	9.14	0.38	9.42	9.48	13.26	4.40	3.17
CO [g/h]	171.86	592.30	247.50	207.98	639.11	26.85	658.46	662.94	926.65	307.46	221.33
NOx [g/h]	33.44	115.24	48.16	40.47	124.35	5.22	128.11	128.98	180.29	59.82	43.06
VOC [g/h]	39.83	137.27	57.36	48.20	148.12	6.22	152.60	153.64	214.76	71.26	51.29

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.964	2.266	2.731
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.53	25.33	53.98	52.14
l_b,int, Bicycle LOS Score for Intersection	2.575	2.779	2.039	2.825
Bicycle LOS	B	C	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	34.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.804

Intersection Setup

Name	Middlefield Road				Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Middlefield Road				Ravenswood Avenue	
Base Volume Input [veh/h]	346	473	305	62	117	376
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	22	44	105	85	34	8
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	368	517	410	147	151	384
Peak Hour Factor	0.8988	0.8988	0.8988	0.8988	0.8988	0.8988
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	102	144	114	41	42	107
Total Analysis Volume [veh/h]	409	575	456	164	168	427
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	106		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		106	
v_co, Outbound Pedestrian Volume crossing	0		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	0		2		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	18		6		8	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	44	35	70	0	33	44
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	18	18	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	48	93	45	0	37	48
Lead / Lag	Lead	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	3.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	No	Yes		Yes	No
Pedestrian Recall	No	Yes	Yes		No	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	2.60	0.00	0.00
g_i, Effective Green Time [s]	35	91	51	35	72
g / C, Green / Cycle	0.27	0.70	0.39	0.27	0.56
(v / s)_i Volume / Saturation Flow Rate	0.23	0.31	0.35	0.09	0.27
s, saturation flow rate [veh/h]	1781	1870	1771	1781	1578
c, Capacity [veh/h]	485	1310	695	479	847
d1, Uniform Delay [s]	44.71	8.40	36.90	38.33	19.01
k, delay calibration	0.25	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.05	1.07	16.04	2.01	2.14
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.84	0.44	0.89	0.35	0.50
d, Delay for Lane Group [s/veh]	53.76	9.47	52.94	40.34	21.15
Lane Group LOS	D	A	D	D	C
Critical Lane Group	Yes	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	13.53	6.78	21.26	4.63	8.58
50th-Percentile Queue Length [ft/ln]	338.21	169.46	531.51	115.70	214.43
95th-Percentile Queue Length [veh/ln]	19.56	11.05	28.82	8.16	13.38
95th-Percentile Queue Length [ft/ln]	489.01	276.20	720.56	203.90	334.51

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	53.76	9.47	52.94	52.94	40.34	21.15
Movement LOS	D	A	D	D	D	C
d_A, Approach Delay [s/veh]	27.88		52.94		26.57	
Approach LOS	C		D		C	
d_I, Intersection Delay [s/veh]	34.59					
Intersection LOS	C					
Intersection V/C	0.804					

Emissions

Vehicle Miles Traveled [mph]	39.18	55.09	649.39	29.26	74.37
Stops [stops/h]	374.63	187.71	588.75	128.16	237.53
Fuel consumption [US gal/h]	8.78	4.62	36.67	3.29	6.21
CO [g/h]	614.05	322.94	2562.90	230.08	434.20
NOx [g/h]	119.47	62.83	498.65	44.77	84.48
VOC [g/h]	142.31	74.84	593.98	53.32	100.63

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.31	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.681	0.000	2.337
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1362	623	500
d_b, Bicycle Delay [s]	6.68	30.90	36.71
l_b,int, Bicycle LOS Score for Intersection	3.183	2.583	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	27.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.525

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street					
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			D Street					
Base Volume Input [veh/h]	5	517	119	175	486	23	1	7	0	141	11	301
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	60	1	1	91	21	4	11	0	2	64	2
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	577	120	176	577	44	5	18	0	143	75	303
Peak Hour Factor	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	161	33	49	161	12	1	5	0	40	21	84
Total Analysis Volume [veh/h]	6	642	134	196	642	49	6	20	0	159	83	337
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	6			7			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			6			7		
v_co, Outbound Pedestrian Volume crossing	137			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			137		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	27			8			0			13		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	28	62	25	22	57	0	62	25	62	57	25	57
Amber [s]	3.5	3.5	3.5	3.0	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.6	0.0	0.0	0.0	0.0	2.6	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	9	55	38	37	83	0	55	38	55	83	38	83
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	3.0	3.6	2.9	3.0	3.6	0.0	3.6	2.9	3.6	3.6	2.9	3.6
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	131	131	131	131	131	131	131	131	131	131
L, Total Lost Time per Cycle [s]	4.50	4.60	4.60	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.50	2.60	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	1	71	71	18	88	88	33	33	33	33
g / C, Green / Cycle	0.01	0.54	0.54	0.14	0.68	0.68	0.25	0.25	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.00	0.18	0.10	0.11	0.19	0.19	0.01	0.01	0.17	0.22
s, saturation flow rate [veh/h]	1781	3560	1335	1781	1870	1816	964	1870	1407	1539
c, Capacity [veh/h]	14	1932	725	251	1266	1230	128	469	398	386
d1, Uniform Delay [s]	64.44	16.65	14.90	54.13	8.37	8.38	56.11	37.04	45.69	46.50
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.10	0.10	0.10	0.16
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	19.07	0.46	0.56	5.28	0.54	0.56	0.14	0.04	1.43	8.69
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.43	0.33	0.18	0.78	0.28	0.28	0.05	0.04	0.61	0.87
d, Delay for Lane Group [s/veh]	83.51	17.11	15.46	59.42	8.91	8.94	56.25	37.07	47.12	55.19
Lane Group LOS	F	B	B	E	A	A	E	D	D	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.27	5.39	2.08	6.55	3.89	3.80	0.19	0.50	7.34	11.32
50th-Percentile Queue Length [ft/ln]	6.81	134.75	52.02	163.67	97.14	94.99	4.82	12.61	183.51	282.88
95th-Percentile Queue Length [veh/ln]	0.49	9.20	3.75	10.74	6.99	6.84	0.35	0.91	11.78	16.83
95th-Percentile Queue Length [ft/ln]	12.26	229.94	93.64	268.58	174.85	170.98	8.67	22.71	294.59	420.80

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	83.51	17.11	15.46	59.42	8.93	8.94	56.25	37.07	37.07	47.12	47.12	55.19
Movement LOS	F	B	B	E	A	A	E	D	D	D	D	E
d_A, Approach Delay [s/veh]		17.34			20.08			41.50			51.82	
Approach LOS		B			C			D			D	
d_I, Intersection Delay [s/veh]	27.46											
Intersection LOS	C											
Intersection V/C	0.525											

Emissions

Vehicle Miles Traveled [mph]	0.66	70.89	14.80	18.78	33.51	32.69	0.44	1.46	203.02	282.71
Stops [stops/h]	7.52	297.39	57.41	180.60	107.19	104.82	5.32	13.92	202.49	312.15
Fuel consumption [US gal/h]	0.18	7.17	1.42	4.44	2.72	2.66	0.10	0.26	11.80	17.15
CO [g/h]	12.84	501.46	99.08	310.61	189.99	185.60	7.23	18.00	824.57	1198.58
NOx [g/h]	2.50	97.57	19.28	60.43	36.96	36.11	1.41	3.50	160.43	233.20
VOC [g/h]	2.98	116.22	22.96	71.99	44.03	43.01	1.68	4.17	191.10	277.78

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.71	54.71	54.71	54.71
l_p,int, Pedestrian LOS Score for Intersectio	3.095	2.752	1.994	2.260
Crosswalk LOS	C	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	774	1203	513	513
d_b, Bicycle Delay [s]	24.86	10.40	36.05	36.29
l_b,int, Bicycle LOS Score for Intersection	2.205	2.291	1.603	2.515
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Version 2024 (SP 0-6) 2/4/2026

Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	58.1
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.729

Intersection Setup

Name	Middlefield Road			Middlefield Road						Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road						Willow Road		
Base Volume Input [veh/h]	81	292	170	210	304	14	17	206	94	361	112	411
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	30	34	75	66	9	0	0	78	5	20	116	25
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	111	326	245	276	313	14	17	284	99	381	228	436
Peak Hour Factor	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	85	64	72	82	4	4	74	26	100	60	114
Total Analysis Volume [veh/h]	116	341	256	289	327	15	18	297	104	398	238	456
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	15			5			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			15			5		
v_co, Outbound Pedestrian Volume crossing	6			4			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			4			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	14			7			5			22		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	0	0	0	0	0	0	0	0	0	0	0
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	32	0	39	39	39	0	33	0	46	46	46
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	3	0	3	3	3	0	3	0	3	3	3
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	21	21	21	21	21	21	21	26	26	26	63	63	63
g / C, Green / Cycle	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.18	0.18	0.18	0.42	0.42	0.42
(v / s)_i Volume / Saturation Flow Rate	0.07	0.11	0.12	0.12	0.12	0.12	0.12	0.01	0.16	0.07	0.18	0.17	0.29
s, saturation flow rate [veh/h]	1781	1870	1716	1499	1781	1834	1839	1781	1870	1521	1781	1847	1552
c, Capacity [veh/h]	250	262	241	210	252	259	260	314	329	268	747	775	651
d1, Uniform Delay [s]	59.30	62.56	62.79	62.65	62.56	62.53	62.56	51.43	60.52	54.47	30.75	30.51	35.42
k, delay calibration	0.11	0.16	0.18	0.19	0.11	0.11	0.11	0.11	0.32	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.34	8.73	11.51	17.27	6.52	6.24	6.33	0.08	21.49	0.92	1.77	1.61	6.17
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.46	0.81	0.84	0.87	0.82	0.82	0.82	0.06	0.90	0.39	0.43	0.41	0.70
d, Delay for Lane Group [s/veh]	60.64	71.30	74.31	79.92	69.08	68.77	68.89	51.50	82.01	55.39	32.52	32.12	41.59
Lane Group LOS	E	E	E	E	E	E	E	D	F	E	C	C	D
Critical Lane Group	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.18	8.56	8.27	7.82	8.13	8.33	8.39	0.58	13.07	3.57	8.69	8.60	14.86
50th-Percentile Queue Length [ft/ln]	104.5	213.8	206.7	195.5	203.37	208.14	209.65	14.46	326.73	89.19	217.24	215.09	371.56
95th-Percentile Queue Length [veh/ln]	7.53	13.35	12.99	12.41	12.81	13.06	13.14	1.04	19.00	6.42	13.52	13.41	21.18
95th-Percentile Queue Length [ft/ln]	188.1	333.8	324.7	310.2	320.30	326.45	328.38	26.03	474.95	160.54	338.10	335.35	529.62

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	60.64	72.43	78.57	68.99	68.84	68.89	51.50	82.01	55.39	32.44	32.12	41.59
Movement LOS	E	E	E	E	E	E	D	F	E	C	C	D
d_A, Approach Delay [s/veh]	72.62			68.91			74.09			36.19		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	58.08											
Intersection LOS	E											
Intersection V/C	0.729											

Emissions

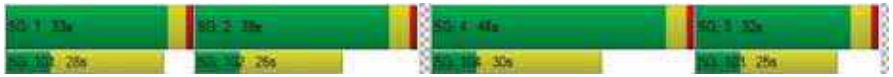
Vehicle Miles Traveled [mph]	2.75	5.05	4.77	4.34	71.14	73.01	73.46	7.51	123.84	43.37	135.18	135.18	193.84
Stops [stops/h]	100.3	205.3	198.5	187.7	195.23	199.82	201.27	13.88	313.66	85.62	208.55	206.49	356.70
Fuel consumption [US gal/h]	2.10	4.43	4.33	4.19	6.91	7.07	7.12	0.57	11.79	3.43	8.98	8.95	13.94
CO [g/h]	146.7	309.7	302.8	292.9	482.78	494.30	497.81	40.14	823.90	239.78	627.91	625.54	974.68
NOx [g/h]	28.55	60.27	58.92	57.00	93.93	96.17	96.86	7.81	160.30	46.65	122.17	121.71	189.64
VOC [g/h]	34.00	71.80	70.18	67.90	111.89	114.56	115.37	9.30	190.95	55.57	145.52	144.98	225.89

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.48	63.48	63.48	63.48
l_p,int, Pedestrian LOS Score for Intersectio	4.312	2.606	2.347	2.800
Crosswalk LOS	E	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	457	383	551
d_b, Bicycle Delay [s]	50.54	44.78	49.17	39.82
l_b,int, Bicycle LOS Score for Intersection	2.973	2.080	2.251	3.361
Bicycle LOS	C	B	B	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	10.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.622

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	53	24	72	27	24	12	1	463	33	29	771	10
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	25	0	11	0	0	0	0	213	6	1	136	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	78	24	83	27	24	12	1	676	39	30	907	10
Peak Hour Factor	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	20	6	21	7	6	3	0	174	10	8	233	3
Total Analysis Volume [veh/h]	80	25	85	28	25	12	1	696	40	31	934	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			1			5		
v_di, Inbound Pedestrian Volume crossing m	5			1			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			6			0		
v_ci, Inbound Pedestrian Volume crossing mi	6			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			5			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	26	0	26	26	26	64	64	64	64	64	64
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	13	13	13	13	69	69	69	69
g / C, Green / Cycle	0.14	0.14	0.14	0.14	0.77	0.77	0.77	0.77
(v / s)_i Volume / Saturation Flow Rate	0.06	0.07	0.02	0.02	0.00	0.40	0.04	0.51
s, saturation flow rate [veh/h]	1367	1614	1275	1750	594	1849	721	1866
c, Capacity [veh/h]	214	230	148	250	386	1417	511	1430
d1, Uniform Delay [s]	38.88	35.50	41.22	33.80	10.57	4.08	7.60	4.97
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.08	1.54	0.61	0.27	0.01	1.36	0.23	2.41
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.37	0.48	0.19	0.15	0.00	0.52	0.06	0.66
d, Delay for Lane Group [s/veh]	39.96	37.04	41.83	34.07	10.58	5.45	7.83	7.38
Lane Group LOS	D	D	D	C	B	A	A	A
Critical Lane Group	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.75	2.31	0.63	0.73	0.01	4.45	0.27	7.07
50th-Percentile Queue Length [ft/ln]	43.82	57.82	15.65	18.20	0.27	111.25	6.81	176.78
95th-Percentile Queue Length [veh/ln]	3.16	4.16	1.13	1.31	0.02	7.91	0.49	11.43
95th-Percentile Queue Length [ft/ln]	78.88	104.08	28.17	32.76	0.48	197.74	12.25	285.81

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	39.96	37.04	37.04	41.83	34.07	34.07	10.58	5.45	5.45	7.83	7.38	7.38
Movement LOS	D	D	D	D	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	38.27			37.41			5.45			7.40		
Approach LOS	D			D			A			A		
d_I, Intersection Delay [s/veh]	10.64											
Intersection LOS	B											
Intersection V/C	0.622											

Emissions

Vehicle Miles Traveled [mph]	5.73	7.88	2.42	3.20	0.43	312.86	3.08	93.84
Stops [stops/h]	70.12	92.52	25.04	29.12	0.43	178.00	10.89	282.85
Fuel consumption [US gal/h]	1.18	1.54	0.44	0.51	0.02	15.57	0.23	6.72
CO [g/h]	82.28	107.52	30.99	35.81	1.60	1088.21	16.06	469.95
NOx [g/h]	16.01	20.92	6.03	6.97	0.31	211.73	3.12	91.43
VOC [g/h]	19.07	24.92	7.18	8.30	0.37	252.20	3.72	108.92

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
l_p,int, Pedestrian LOS Score for Intersectio	2.061	1.968	2.531	2.533
Crosswalk LOS	B	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	487	487	1331	1331
d_b, Bicycle Delay [s]	25.78	25.79	5.05	5.06
l_b,int, Bicycle LOS Score for Intersection	1.873	1.667	2.776	3.168
Bicycle LOS	A	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	9.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.646

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	4	1	3	86	4	28	10	545	5	3	774	57
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	224	0	0	137	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	1	3	86	4	28	10	769	5	3	911	57
Peak Hour Factor	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	0	1	22	1	7	3	194	1	1	230	14
Total Analysis Volume [veh/h]	4	1	3	87	4	28	10	777	5	3	921	58
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			10			1		
v_di, Inbound Pedestrian Volume crossing m	10			1			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			6			12		
v_ci, Inbound Pedestrian Volume crossing mi	12			6			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			6			5			7		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	30.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	36	0	36	36	36	94	94	94	94	94	94
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	14	14	108	108	108	108
g / C, Green / Cycle	0.11	0.11	0.83	0.83	0.83	0.83
(v / s)_i Volume / Saturation Flow Rate	0.01	0.08	0.02	0.42	0.00	0.53
s, saturation flow rate [veh/h]	1589	1461	574	1867	691	1848
c, Capacity [veh/h]	217	209	403	1544	524	1527
d1, Uniform Delay [s]	51.69	55.75	10.33	3.36	6.77	4.15
k, delay calibration	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	2.43	0.11	1.19	0.02	2.08
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.04	0.57	0.02	0.51	0.01	0.64
d, Delay for Lane Group [s/veh]	51.76	58.18	10.45	4.55	6.79	6.23
Lane Group LOS	D	E	B	A	A	A
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.24	3.93	0.13	5.32	0.03	7.85
50th-Percentile Queue Length [ft/ln]	6.03	98.16	3.27	132.98	0.73	196.35
95th-Percentile Queue Length [veh/ln]	0.43	7.07	0.24	9.10	0.05	12.45
95th-Percentile Queue Length [ft/ln]	10.86	176.69	5.88	227.53	1.31	311.25

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	51.76	51.76	51.76	58.18	58.18	58.18	10.45	4.55	4.55	6.79	6.23	6.23
Movement LOS	D	D	D	E	E	E	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	51.76			58.18			4.63			6.23		
Approach LOS	D			E			A			A		
d_I, Intersection Delay [s/veh]	9.01											
Intersection LOS	A											
Intersection V/C	0.646											

Emissions

Vehicle Miles Traveled [mph]	0.23	2.82	0.99	77.73	0.88	286.74
Stops [stops/h]	6.68	108.73	3.62	147.30	0.81	217.49
Fuel consumption [US gal/h]	0.12	2.13	0.08	4.78	0.04	14.25
CO [g/h]	8.39	148.58	5.58	334.46	3.13	995.90
NOx [g/h]	1.63	28.91	1.09	65.07	0.61	193.77
VOC [g/h]	1.95	34.43	1.29	77.52	0.73	230.81

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	1.745	1.838	2.436	2.723
Crosswalk LOS	A	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	491	491	1383	1383
d_b, Bicycle Delay [s]	37.01	37.13	6.20	6.21
l_b,int, Bicycle LOS Score for Intersection	1.573	1.756	2.866	3.180
Bicycle LOS	A	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	39.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.892

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	73	6	69	54	3	16	15	903	7	30	877	52
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	13	0	8	4	220	0	0	129	4
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	73	6	69	67	3	24	19	1123	7	30	1006	56
Peak Hour Factor	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	2	18	17	1	6	5	289	2	8	259	14
Total Analysis Volume [veh/h]	75	6	71	69	3	25	20	1157	7	31	1036	58
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			18			4		
v_di, Inbound Pedestrian Volume crossing m	18			4			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			6			5		
v_ci, Inbound Pedestrian Volume crossing mi	5			6			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			12			4			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	143	143	143	143	143	143	143	143	143	143
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	14	14	8	8	8	3	98	98	5	100
g / C, Green / Cycle	0.10	0.10	0.06	0.06	0.06	0.02	0.68	0.68	0.03	0.70
(v / s)_i Volume / Saturation Flow Rate	0.08	0.07	0.03	0.03	0.02	0.02	0.35	0.35	0.03	0.72
s, saturation flow rate [veh/h]	937	1183	937	1359	1362	937	1422	1866	937	1528
c, Capacity [veh/h]	94	119	54	79	79	19	970	1272	32	1064
d1, Uniform Delay [s]	63.14	62.14	65.80	65.79	64.75	70.40	11.26	11.26	69.29	21.83
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.23	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	13.87	5.77	8.10	5.63	2.26	118.80	0.92	0.71	65.54	35.03
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.79	0.65	0.54	0.54	0.32	1.07	0.52	0.52	0.97	1.03
d, Delay for Lane Group [s/veh]	77.02	67.90	73.90	71.42	67.01	189.20	12.18	11.97	134.83	56.86
Lane Group LOS	E	E	E	E	E	F	B	B	F	F
Critical Lane Group	Yes	No	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.07	2.92	1.20	1.69	0.95	1.30	7.86	10.24	1.73	43.32
50th-Percentile Queue Length [ft/ln]	76.74	73.11	30.07	42.16	23.82	32.53	196.54	256.10	43.32	1082.94
95th-Percentile Queue Length [veh/ln]	5.53	5.26	2.17	3.04	1.72	2.34	12.46	15.49	3.12	55.54
95th-Percentile Queue Length [ft/ln]	138.13	131.60	54.13	75.88	42.88	58.55	311.49	387.33	77.98	1388.41

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	77.02	67.90	67.90	72.48	71.42	67.01	189.20	12.06	11.97	134.83	56.86	56.86
Movement LOS	E	E	E	E	E	E	F	B	B	F	E	E
d_A, Approach Delay [s/veh]	72.40			71.03			15.05			59.01		
Approach LOS	E			E			B			E		
d_I, Intersection Delay [s/veh]	39.91											
Intersection LOS	D											
Intersection V/C	0.892											

Emissions

Vehicle Miles Traveled [mph]	3.58	3.67	1.13	1.63	0.96	5.86	147.43	193.50	3.99	140.79
Stops [stops/h]	77.03	73.38	30.18	42.32	23.91	32.65	197.27	257.07	43.48	1087.01
Fuel consumption [US gal/h]	1.63	1.51	0.53	0.74	0.41	1.19	8.41	11.00	1.20	23.16
CO [g/h]	114.06	105.59	37.03	52.01	28.93	83.28	587.63	768.56	83.64	1618.79
NOx [g/h]	22.19	20.54	7.20	10.12	5.63	16.20	114.33	149.53	16.27	314.96
VOC [g/h]	26.43	24.47	8.58	12.05	6.71	19.30	136.19	178.12	19.39	375.17

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	61.15	61.15	61.15	61.15
l_p,int, Pedestrian LOS Score for Intersectio	2.015	2.168	2.719	2.803
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	418	418	279	279
d_b, Bicycle Delay [s]	44.96	45.14	53.23	53.23
l_b,int, Bicycle LOS Score for Intersection	1.810	1.720	2.536	3.416
Bicycle LOS	A	A	B	C

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	68.0
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.080

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	254	58	43	1173	1095	590
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	25	0	0	233	133	70
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	279	58	43	1406	1228	660
Peak Hour Factor	0.9360	0.9360	0.9360	0.9360	0.9360	0.9360
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	75	15	11	376	328	176
Total Analysis Volume [veh/h]	298	62	46	1502	1312	705
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	2		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		4		8	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	18	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	20	12	60	48	48
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	79	79	79	79	79	79
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	27	27	3	43	36	36
g / C, Green / Cycle	0.34	0.34	0.04	0.54	0.46	0.46
(v / s)_i Volume / Saturation Flow Rate	0.32	0.04	0.04	0.57	0.47	0.58
s, saturation flow rate [veh/h]	937	1589	1312	2623	2792	1222
c, Capacity [veh/h]	318	539	52	1412	1270	555
d1, Uniform Delay [s]	25.34	17.99	37.86	18.28	21.58	21.12
k, delay calibration	0.19	0.04	0.04	0.20	0.15	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	18.89	0.03	16.95	35.63	23.60	134.84
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.94	0.12	0.89	1.06	1.03	1.27
d, Delay for Lane Group [s/veh]	44.24	18.02	54.80	53.90	45.18	155.95
Lane Group LOS	D	B	D	F	F	F
Critical Lane Group	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.75	0.76	1.11	18.07	14.46	29.63
50th-Percentile Queue Length [ft/ln]	168.82	18.90	27.79	451.80	361.60	740.63
95th-Percentile Queue Length [veh/ln]	11.01	1.36	2.00	26.23	21.19	44.98
95th-Percentile Queue Length [ft/ln]	275.37	34.02	50.02	655.81	529.68	1124.46

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	44.24	18.02	54.80	53.90	45.18	155.95
Movement LOS	D	B	D	F	F	F
d_A, Approach Delay [s/veh]	39.72		53.93		83.90	
Approach LOS	D		D		F	
d_I, Intersection Delay [s/veh]	68.03					
Intersection LOS	E					
Intersection V/C	1.080					

Emissions

Vehicle Miles Traveled [mph]	216.96	45.14	5.92	193.30	153.99	82.74
Stops [stops/h]	307.52	34.43	50.62	1645.96	1317.34	1349.11
Fuel consumption [US gal/h]	13.31	2.28	1.04	33.53	27.84	35.67
CO [g/h]	930.58	159.08	72.44	2343.44	1946.01	2493.40
NOx [g/h]	181.06	30.95	14.09	455.95	378.62	485.13
VOC [g/h]	215.67	36.87	16.79	543.12	451.01	577.87

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	29.29	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.294	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	400	1379	1075
d_b, Bicycle Delay [s]	25.31	3.82	8.48
l_b,int, Bicycle LOS Score for Intersection	1.560	2.837	3.224
Bicycle LOS	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	119.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.901

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

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Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	250	0	240	0	853	574	0	1445	1040	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	217	0	2	0	238	19	0	201	179	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	467	0	242	0	1091	593	0	1646	1219	0	0	0
Peak Hour Factor	0.9611	1.0000	0.9611	1.0000	0.9611	0.9611	1.0000	0.9611	0.9611	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	121	0	63	0	284	154	0	428	317	0	0	0
Total Analysis Volume [veh/h]	486	0	252	0	1135	617	0	1713	1268	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	8			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			8			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			4			8			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	23	0	0	0	57	0	0	57	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	4	0	0	4	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				No			No				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	80	80	80	80	80	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
I2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	14	14	58	58	58	
g / C, Green / Cycle	0.18	0.18	0.72	0.72	0.72	
(v / s)_i Volume / Saturation Flow Rate	0.14	0.09	0.22	0.34	1.38	
s, saturation flow rate [veh/h]	3459	2776	5094	5094	918	
c, Capacity [veh/h]	620	498	3671	3671	662	
d1, Uniform Delay [s]	31.35	29.59	4.02	4.70	10.52	
k, delay calibration	0.11	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	2.22	0.80	0.22	0.43	417.65	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.78	0.51	0.31	0.47	1.92	
d, Delay for Lane Group [s/veh]	33.57	30.39	4.23	5.13	428.17	
Lane Group LOS	C	C	A	A	F	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	4.54	2.18	1.68	2.98	84.15	
50th-Percentile Queue Length [ft/ln]	113.49	54.59	41.97	74.52	2103.63	
95th-Percentile Queue Length [veh/ln]	8.03	3.93	3.02	5.37	142.06	
95th-Percentile Queue Length [ft/ln]	200.85	98.27	75.55	134.14	3551.62	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	33.57	0.00	30.39	0.00	4.23	0.00	0.00	5.13	428.17	0.00	0.00	0.00
Movement LOS	C		C		A			A	F			
d_A, Approach Delay [s/veh]	32.48			2.78			185.08			0.00		
Approach LOS	C			A			F			A		
d_I, Intersection Delay [s/veh]	119.25											
Intersection LOS	F											
Intersection V/C	1.901											

Emissions

Vehicle Miles Traveled [mph]	11.52	5.98	133.21	171.72	127.11	
Stops [stops/h]	408.58	196.54	226.65	402.42	3786.53	
Fuel consumption [US gal/h]	6.05	2.89	7.71	11.08	136.61	
CO [g/h]	423.00	202.03	539.23	774.56	9549.29	
NOx [g/h]	82.30	39.31	104.91	150.70	1857.94	
VOC [g/h]	98.03	46.82	124.97	179.51	2213.14	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	31.51	0.00	31.51
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.021	0.000	1.419
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	475	1325	1325	0
d_b, Bicycle Delay [s]	23.26	4.57	4.57	40.00
l_b,int, Bicycle LOS Score for Intersection	1.560	2.184	3.199	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	44.1
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.740

Intersection Setup

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

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Volumes

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	497	0	617	0	0	0	0	749	354	0	1988	415
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	15	0	568	0	0	0	0	448	7	0	365	108
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	512	0	1185	0	0	0	0	1197	361	0	2353	523
Peak Hour Factor	0.9889	1.0000	0.9889	1.0000	1.0000	1.0000	1.0000	0.9889	0.9889	1.0000	0.9889	0.9889
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	129	0	300	0	0	0	0	303	91	0	595	132
Total Analysis Volume [veh/h]	518	0	1198	0	0	0	0	1210	365	0	2379	529
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	0	7	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	0	30	0	50	0	0	58	0
Amber [s]	3.0	0.0	3.0	0.0	0.0	3.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	0.0	1.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	0	0	5	0	0	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	0	10	0	0	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No					No		No			No	
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	0	10	0	0	20	0	50	0	0	50	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	0	5	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No			No		No			No	
Maximum Recall	No		No			No		No			No	
Pedestrian Recall	No		No			No		No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	R	C	C	R
C, Calculated Cycle Length [s]	80	80	80	80	80	80
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	16	26	16	46	56	46
g / C, Green / Cycle	0.20	0.33	0.20	0.58	0.70	0.58
(v / s)_i Volume / Saturation Flow Rate	0.19	0.43	0.00	0.24	0.47	0.33
s, saturation flow rate [veh/h]	2752	2813	1589	5094	5094	1589
c, Capacity [veh/h]	572	914	318	2929	3566	914
d1, Uniform Delay [s]	33.49	27.00	0.00	9.48	6.75	10.83
k, delay calibration	0.11	0.13	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	5.78	141.78	0.00	0.43	1.01	2.67
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.91	1.31	0.00	0.41	0.67	0.58
d, Delay for Lane Group [s/veh]	39.27	168.78	0.00	9.91	7.76	13.50
Lane Group LOS	D	F	A	A	A	B
Critical Lane Group	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	5.39	26.21	0.00	3.59	5.96	5.88
50th-Percentile Queue Length [ft/ln]	134.70	655.28	0.00	89.69	149.00	146.98
95th-Percentile Queue Length [veh/ln]	9.19	40.26	0.00	6.46	9.96	9.86
95th-Percentile Queue Length [ft/ln]	229.87	1006.44	0.00	161.43	249.09	246.39

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	39.27	0.00	168.78	0.00	0.00	0.00	0.00	9.91	0.00	0.00	7.76	13.50
Movement LOS	D		F			A		A			A	B
d_A, Approach Delay [s/veh]	129.69			0.00			7.63			8.80		
Approach LOS	F			A			A			A		
d_I, Intersection Delay [s/veh]	44.12											
Intersection LOS	D											
Intersection V/C	0.740											

Emissions

Vehicle Miles Traveled [mph]	21.74	50.28	0.00	121.30	139.61	31.04
Stops [stops/h]	484.93	2359.02	0.00	484.30	804.58	264.56
Fuel consumption [US gal/h]	7.71	56.24	0.00	10.11	13.95	4.19
CO [g/h]	539.20	3931.47	0.00	706.62	975.10	293.08
NOx [g/h]	104.91	764.92	0.00	137.48	189.72	57.02
VOC [g/h]	124.97	911.16	0.00	163.77	225.99	67.92

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0			9.0			0.0			0.0		
M_corner, Corner Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	31.51			31.51			0.00			0.00		
l_p,int, Pedestrian LOS Score for Intersectio	2.630			1.968			0.000			0.000		
Crosswalk LOS	B			A			F			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	400			400			1150			1400		
d_b, Bicycle Delay [s]	25.60			25.60			7.23			3.60		
l_b,int, Bicycle LOS Score for Intersection	1.560			1.560			2.225			3.159		
Bicycle LOS	A			A			B			C		

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.PM.vistro
Report File: C:\...\N PM.pdf

Scenario 18 Near-Term PM
2/4/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road/101 NB Ramps	Signalized	HCM 7th Edition	WB Left	0.882	21.7	C
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	EB Left	0.880	24.6	C
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	NB Left	0.742	20.4	C
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	NB Left	0.656	30.7	C
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	SB Left	0.544	20.6	C
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	EB Thru	0.702	63.5	E
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	NB Left	0.796	37.5	D
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	NB Left	0.685	31.3	C
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	NB Left	0.549	27.7	C
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	EB Thru	0.749	56.5	E
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	SB Left	0.770	17.2	B
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.815	14.4	B
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	EB Left	0.739	18.4	B
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	EB Left	0.916	19.0	B
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	1.336	63.8	E
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	0.912	171.9	F

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V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road/101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	21.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.882

Intersection Setup

Name	Marsh Road (SR 84)		Marsh Road		101 NB Ramps	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

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Volumes

Name	Marsh Road (SR 84)		Marsh Road		101 NB Ramps	
Base Volume Input [veh/h]	1819	0	0	818	604	181
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	331	0	0	396	0	121
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2150	0	0	1214	604	302
Peak Hour Factor	0.9490	1.0000	1.0000	0.9490	0.9490	0.9490
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	566	0	0	320	159	80
Total Analysis Volume [veh/h]	2266	0	0	1279	636	318
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		3		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		3	
v_co, Outbound Pedestrian Volume crossing	5		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		5	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		2		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	100	0	0	100	100	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	70	0	0	70	30	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	Yes	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	68	68	28	28
g / C, Green / Cycle	0.68	0.68	0.28	0.28
(v / s)_i Volume / Saturation Flow Rate	0.64	0.36	0.18	0.11
s, saturation flow rate [veh/h]	3560	3560	3459	2798
c, Capacity [veh/h]	2403	2403	968	784
d1, Uniform Delay [s]	14.53	8.24	31.76	29.22
k, delay calibration	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.12	0.85	3.48	1.56
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.94	0.53	0.66	0.41
d, Delay for Lane Group [s/veh]	23.65	9.09	35.24	30.78
Lane Group LOS	C	A	D	C
Critical Lane Group	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	22.19	6.41	7.14	3.24
50th-Percentile Queue Length [ft/ln]	554.78	160.37	178.43	80.95
95th-Percentile Queue Length [veh/ln]	29.92	10.57	11.52	5.83
95th-Percentile Queue Length [ft/ln]	747.92	264.21	287.96	145.71

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	23.65	0.00	0.00	9.09	35.24	30.78
Movement LOS	C			A	D	C
d_A, Approach Delay [s/veh]	23.65		9.09		33.75	
Approach LOS	C		A		C	
d_I, Intersection Delay [s/veh]	21.65					
Intersection LOS	C					
Intersection V/C	0.882					

Emissions

Vehicle Miles Traveled [mph]	200.91	30.24	15.08	7.54
Stops [stops/h]	1597.76	461.85	513.87	233.14
Fuel consumption [US gal/h]	28.00	6.16	8.02	3.59
CO [g/h]	1957.49	430.78	560.62	250.97
NOx [g/h]	380.86	83.81	109.08	48.83
VOC [g/h]	453.67	99.84	129.93	58.16

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	41.41	39.61
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.079	2.368
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1308	1308	516
d_b, Bicycle Delay [s]	5.99	5.99	27.53
l_b,int, Bicycle LOS Score for Intersection	3.429	2.615	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	24.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.880

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	821	1056	279	1267	537
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	201	265	0	216	24
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1022	1321	279	1483	561
Peak Hour Factor	1.0000	0.9770	0.9770	1.0000	0.9770	0.9770
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	262	338	70	379	144
Total Analysis Volume [veh/h]	0	1046	1352	279	1518	574
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		1	
v_co, Outbound Pedestrian Volume crossing	0		6		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		6	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		4		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	100	100	0	100	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	12	16	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	40	40	0	60	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	49	47	46	46
g / C, Green / Cycle	0.49	0.47	0.46	0.46
(v / s)_i Volume / Saturation Flow Rate	0.26	0.38	0.44	0.36
s, saturation flow rate [veh/h]	4000	3560	3459	1588
c, Capacity [veh/h]	1972	1680	1598	734
d1, Uniform Delay [s]	17.41	22.48	25.78	22.64
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.03	4.21	1.59	0.70
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.53	0.80	0.95	0.78
d, Delay for Lane Group [s/veh]	18.44	26.69	27.38	23.34
Lane Group LOS	B	C	C	C
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	8.21	13.58	16.67	10.98
50th-Percentile Queue Length [ft/ln]	205.29	339.40	416.72	274.47
95th-Percentile Queue Length [veh/ln]	12.91	19.62	23.36	16.41
95th-Percentile Queue Length [ft/ln]	322.78	490.47	584.11	410.32

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	18.44	26.69	0.00	27.38	23.34
Movement LOS		B	C		C	C
d_A, Approach Delay [s/veh]	18.44		26.69		26.27	
Approach LOS	B		C		C	
d_I, Intersection Delay [s/veh]	24.57					
Intersection LOS	C					
Intersection V/C	0.880					

Emissions

Vehicle Miles Traveled [mph]	131.63	109.62	35.90	13.58
Stops [stops/h]	591.24	977.48	1200.16	395.24
Fuel consumption [US gal/h]	12.61	18.87	16.57	5.47
CO [g/h]	881.44	1319.30	1157.93	382.30
NOx [g/h]	171.50	256.69	225.29	74.38
VOC [g/h]	204.28	305.76	268.36	88.60

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	41.41	0.00	39.61
l_p,int, Pedestrian LOS Score for Intersectio	2.886	0.000	2.625
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	708	708	1118
d_b, Bicycle Delay [s]	20.87	20.91	9.72
l_b,int, Bicycle LOS Score for Intersection	2.423	2.675	1.560
Bicycle LOS	B	B	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	20.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.742

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	1	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Base Volume Input [veh/h]	32	1197	2	52	1246	295	248	4	2	12	5	142
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	201	0	0	289	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	32	1398	2	52	1535	295	248	4	2	12	5	142
Peak Hour Factor	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	357	1	13	392	75	63	1	1	3	1	36
Total Analysis Volume [veh/h]	33	1428	2	53	1568	301	253	4	2	12	5	145
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	8			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			8			0		
v_co, Outbound Pedestrian Volume crossing	1			0			1			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			1			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	0	1	6	0	0	4	0	0	3	0
Auxiliary Signal Groups												
Maximum Green [s]	15	40	0	10	40	0	0	20	0	0	20	0
Amber [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	7	0	0	8	0	0	8	0
Pedestrian Clearance [s]	0	21	0	0	21	0	0	24	0	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	57	0	20	62	0	0	32	0	0	36	0
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	4	10	0	0	4	0	0	6	0
Vehicle Extension [s]	2.5	3.5	0.0	2.0	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	5	102	102	6	102	102	18	18	12	12
g / C, Green / Cycle	0.04	0.70	0.70	0.04	0.70	0.70	0.12	0.12	0.08	0.08
(v / s)_i Volume / Saturation Flow Rate	0.02	0.26	0.26	0.02	0.50	0.53	0.07	0.07	0.01	0.05
s, saturation flow rate [veh/h]	1781	3560	1869	3459	1870	1769	1781	1780	1806	2813
c, Capacity [veh/h]	67	2498	1311	137	1316	1245	217	217	148	230
d1, Uniform Delay [s]	68.43	8.76	8.76	67.90	12.73	13.46	60.30	60.30	61.72	64.46
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.13	0.43	0.82	0.66	3.28	4.17	1.95	1.95	0.25	2.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.49	0.38	0.38	0.39	0.71	0.75	0.60	0.60	0.12	0.63
d, Delay for Lane Group [s/veh]	72.56	9.19	9.58	68.56	16.01	17.64	62.25	62.25	61.98	66.58
Lane Group LOS	E	A	A	E	B	B	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	1.28	5.81	6.24	0.97	17.69	18.83	4.69	4.69	0.60	2.69
50th-Percentile Queue Length [ft/ln]	31.89	145.18	155.95	24.25	442.26	470.84	117.19	117.16	14.99	67.31
95th-Percentile Queue Length [veh/ln]	2.30	9.76	10.33	1.75	24.59	25.95	8.24	8.24	1.08	4.85
95th-Percentile Queue Length [ft/ln]	57.40	243.99	258.35	43.65	614.71	648.78	205.96	205.91	26.99	121.16

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	72.56	9.33	9.58	68.56	16.67	17.64	62.25	62.25	62.25	61.98	61.98	66.58
Movement LOS	E	A	A	E	B	B	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	10.75			18.25			62.25			66.10		
Approach LOS	B			B			E			E		
d_I, Intersection Delay [s/veh]	20.40											
Intersection LOS	C											
Intersection V/C	0.742											

Emissions

Vehicle Miles Traveled [mph]	6.76	192.05	100.79	6.67	117.76	117.44	3.91	3.90	1.16	9.86
Stops [stops/h]	31.67	288.36	154.87	48.17	439.21	467.60	116.38	116.35	14.89	133.69
Fuel consumption [US gal/h]	0.98	11.24	5.97	1.36	10.84	11.34	2.26	2.26	0.32	2.92
CO [g/h]	68.71	785.92	417.06	94.77	757.83	792.85	158.16	158.11	22.61	204.16
NOx [g/h]	13.37	152.91	81.15	18.44	147.45	154.26	30.77	30.76	4.40	39.72
VOC [g/h]	15.92	182.14	96.66	21.96	175.63	183.75	36.65	36.64	5.24	47.31

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	61.00	61.00	61.92	61.92
l_p,int, Pedestrian LOS Score for Intersectio	3.052	3.225	2.125	2.359
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	717	786	383	439
d_b, Bicycle Delay [s]	29.82	26.70	47.36	44.19
l_b,int, Bicycle LOS Score for Intersection	2.364	3.145	1.987	1.827
Bicycle LOS	B	C	A	A

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	30.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.656

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Base Volume Input [veh/h]	182	683	24	3	798	492	476	17	131	42	21	22
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	201	0	0	289	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	182	884	24	3	1087	492	476	17	131	42	21	22
Peak Hour Factor	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	47	227	6	1	279	126	122	4	34	11	5	6
Total Analysis Volume [veh/h]	187	909	25	3	1117	506	489	17	135	43	22	23
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	15			6			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			15			6		
v_co, Outbound Pedestrian Volume crossing	3			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			3		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			1			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	31.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	50	50	50	0	50	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	22	45	45	22	45	45	37	36	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall		Yes		No	Yes			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	140	140	140	140	140	140	140	140	140	140	140
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	90	90	90	2	91	91	27	27	27	13	13
g / C, Green / Cycle	0.64	0.64	0.64	0.02	0.65	0.65	0.19	0.19	0.19	0.09	0.09
(v / s)_i Volume / Saturation Flow Rate	0.54	0.25	0.25	0.00	0.45	0.47	0.14	0.14	0.09	0.02	0.03
s, saturation flow rate [veh/h]	345	1870	1850	1781	1870	1677	1781	1787	1532	1781	1696
c, Capacity [veh/h]	197	1202	1189	32	1208	1083	340	342	293	162	154
d1, Uniform Delay [s]	63.99	11.93	11.93	67.63	15.88	16.54	53.37	53.37	50.05	59.26	59.41
k, delay calibration	0.50	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	52.17	0.96	0.97	0.47	3.27	4.27	2.39	2.38	0.84	0.64	0.77
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.95	0.39	0.39	0.09	0.69	0.73	0.74	0.74	0.46	0.27	0.29
d, Delay for Lane Group [s/veh]	116.16	12.88	12.90	68.10	19.15	20.81	55.76	55.75	50.89	59.90	60.17
Lane Group LOS	F	B	B	E	B	C	E	E	D	E	E
Critical Lane Group	No	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	5.25	7.06	7.00	0.11	17.18	17.06	8.70	8.73	4.32	1.47	1.54
50th-Percentile Queue Length [ft/ln]	131.33	176.44	175.01	2.74	429.58	426.50	217.61	218.20	107.93	36.75	38.61
95th-Percentile Queue Length [veh/ln]	9.01	11.41	11.34	0.20	23.98	23.83	13.54	13.57	7.72	2.65	2.78
95th-Percentile Queue Length [ft/ln]	225.29	285.36	283.49	4.93	599.54	595.85	338.57	339.33	193.11	66.14	69.50

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	116.16	12.89	12.90	68.10	19.57	20.81	55.75	55.75	50.89	59.90	60.17	60.17
Movement LOS	F	B	B	E	B	C	E	E	D	E	E	E
d_A, Approach Delay [s/veh]	30.12			20.05			54.73			60.04		
Approach LOS	C			C			D			E		
d_I, Intersection Delay [s/veh]	30.70											
Intersection LOS	C											
Intersection V/C	0.656											

Emissions

Vehicle Miles Traveled [mph]	29.71	74.54	73.86	0.61	171.21	161.16	29.24	29.33	15.63	2.37	2.48
Stops [stops/h]	135.08	181.48	180.01	2.82	441.85	438.69	223.82	224.44	111.01	37.80	39.72
Fuel consumption [US gal/h]	6.57	5.44	5.39	0.09	13.11	12.78	5.04	5.05	2.53	0.78	0.81
CO [g/h]	459.10	379.99	376.73	6.02	916.20	892.99	352.29	353.26	176.60	54.22	56.96
NOx [g/h]	89.32	73.93	73.30	1.17	178.26	173.74	68.54	68.73	34.36	10.55	11.08
VOC [g/h]	106.40	88.07	87.31	1.40	212.34	206.96	81.65	81.87	40.93	12.57	13.20

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.43	59.43	59.43	59.43
l_p,int, Pedestrian LOS Score for Intersectio	2.932	3.110	2.625	1.997
Crosswalk LOS	C	C	B	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	577	577	457	469
d_b, Bicycle Delay [s]	35.45	35.43	41.68	41.04
l_b,int, Bicycle LOS Score for Intersection	2.484	2.901	2.617	1.705
Bicycle LOS	B	C	B	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	20.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.544

Intersection Setup

Name				Marsh Road			Bay Road					
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			No		

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Volumes

Name				Marsh Road			Bay Road					
Base Volume Input [veh/h]	3	697	68	156	755	71	71	34	6	63	21	117
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	194	0	11	278	0	0	0	0	0	0	7
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	891	68	167	1033	71	71	34	6	63	21	124
Peak Hour Factor	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	236	18	44	274	19	19	9	2	17	6	33
Total Analysis Volume [veh/h]	3	946	72	177	1097	75	75	36	6	67	22	132
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			13			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			13		
v_co, Outbound Pedestrian Volume crossing	0			2			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			2			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			4			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	4.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	0	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	17	0	0	0	17	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	105	70	105	35	105	70	45	45	45	0	45	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
I2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	96	96	19	118	118	28	28
g / C, Green / Cycle	0.64	0.64	0.13	0.78	0.78	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.29	0.29	0.10	0.32	0.32	0.11	0.14
s, saturation flow rate [veh/h]	1863	1652	1781	1870	1822	1020	1586
c, Capacity [veh/h]	1213	1054	225	1467	1429	228	325
d1, Uniform Delay [s]	13.83	13.87	63.54	5.10	5.12	56.62	57.66
k, delay calibration	0.50	0.50	0.11	0.50	0.50	0.23	0.24
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.19	1.43	5.97	0.83	0.86	3.78	5.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.45	0.46	0.79	0.40	0.41	0.51	0.68
d, Delay for Lane Group [s/veh]	15.02	15.30	69.51	5.93	5.98	60.40	63.14
Lane Group LOS	B	B	E	A	A	E	E
Critical Lane Group	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	9.66	8.68	6.92	5.41	5.33	4.44	8.45
50th-Percentile Queue Length [ft/ln]	241.48	217.00	172.91	135.29	133.37	110.98	211.28
95th-Percentile Queue Length [veh/ln]	14.76	13.51	11.23	9.23	9.12	7.89	13.22
95th-Percentile Queue Length [ft/ln]	368.91	337.80	280.74	230.67	228.07	197.37	330.47

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	15.02	15.14	15.30	69.51	5.95	5.98	60.40	60.40	60.40	63.14	63.14	63.14
Movement LOS	B	B	B	E	A	A	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	15.15			14.29			60.40			63.14		
Approach LOS	B			B			E			E		
d_I, Intersection Delay [s/veh]	20.59											
Intersection LOS	C											
Intersection V/C	0.544											

Emissions

Vehicle Miles Traveled [mph]	344.28	306.32	28.12	94.00	92.21	9.09	359.68
Stops [stops/h]	231.82	208.32	165.99	129.88	128.04	106.54	202.83
Fuel consumption [US gal/h]	17.10	15.26	4.82	5.27	5.18	2.26	18.77
CO [g/h]	1195.62	1066.50	337.18	368.64	362.35	157.67	1311.77
NOx [g/h]	232.62	207.50	65.60	71.72	70.50	30.68	255.22
VOC [g/h]	277.10	247.17	78.14	85.44	83.98	36.54	304.02

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	99.9	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	64.40	8.37	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.000	1.750	0.000
Crosswalk LOS	F	C	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	865	1332	537	537
d_b, Bicycle Delay [s]	24.16	8.38	40.11	40.11
l_b,int, Bicycle LOS Score for Intersection	2.402	2.673	1.753	1.924
Bicycle LOS	B	B	A	A

Sequence

Ring 1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	63.5
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.702

Intersection Setup

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	149	99	21	40	97	23	100	525	60	20	351	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	86	0	5	0	0	1	1	59	100	58	104	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	235	99	26	40	97	24	101	584	160	78	455	9
Peak Hour Factor	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	63	27	7	11	26	6	27	156	43	21	122	2
Total Analysis Volume [veh/h]	252	106	28	43	104	26	108	625	171	84	487	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			10			11		
v_di, Inbound Pedestrian Volume crossing m	11			10			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			12			12		
v_ci, Inbound Pedestrian Volume crossing mi	12			12			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	7			8			6			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	180
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	35	35	35	35	35	35	30	60	60	30	30	30
Amber [s]	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	46	40	46	40	46	13	84	84	10	81	81
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	4	4	4	4	4
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	180	180	180	180	180	180	180	180
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	0.00	2.10	0.00	2.00
g_i, Effective Green Time [s]	42	42	36	36	90	80	90	77
g / C, Green / Cycle	0.23	0.23	0.20	0.20	0.50	0.44	0.50	0.43
(v / s)_i Volume / Saturation Flow Rate	0.14	0.08	0.02	0.07	0.11	0.45	0.11	0.27
s, saturation flow rate [veh/h]	1781	1779	1781	1791	1005	1784	780	1861
c, Capacity [veh/h]	415	414	355	357	374	792	161	800
d1, Uniform Delay [s]	61.71	57.29	59.11	62.19	28.75	50.05	41.88	39.93
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.49	0.19	0.20
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.49	2.06	0.70	2.85	0.42	32.84	4.54	1.43
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.32	0.12	0.36	0.29	1.00	0.52	0.62
d, Delay for Lane Group [s/veh]	68.20	59.36	59.80	65.05	29.17	82.89	46.42	41.36
Lane Group LOS	E	E	E	E	C	F	D	D
Critical Lane Group	Yes	No	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	11.16	5.38	1.72	5.52	2.61	42.72	2.17	17.68
50th-Percentile Queue Length [ft/ln]	279.03	134.46	42.88	138.03	65.22	1068.08	54.26	442.12
95th-Percentile Queue Length [veh/ln]	16.64	9.18	3.09	9.38	4.70	53.66	3.91	24.58
95th-Percentile Queue Length [ft/ln]	416.01	229.55	77.19	234.38	117.40	1341.49	97.66	614.54

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	68.20	59.36	59.36	59.80	65.05	65.05	29.17	82.89	82.89	46.42	41.36	41.36
Movement LOS	E	E	E	E	E	E	C	F	F	D	D	D
d_A, Approach Delay [s/veh]	65.13			63.74			76.48			42.09		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	63.48											
Intersection LOS	E											
Intersection V/C	0.702											

Emissions

Vehicle Miles Traveled [mph]	145.25	77.24	1.02	3.08	25.63	188.93	14.82	87.66
Stops [stops/h]	223.23	107.57	34.31	110.43	52.18	854.46	43.41	353.70
Fuel consumption [US gal/h]	10.71	5.39	0.70	2.28	1.98	25.92	1.64	9.75
CO [g/h]	748.61	376.92	48.98	159.57	138.71	1812.10	114.85	681.23
NOx [g/h]	145.65	73.33	9.53	31.05	26.99	352.57	22.35	132.54
VOC [g/h]	173.50	87.35	11.35	36.98	32.15	419.97	26.62	157.88

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	79.34	79.34	79.34	79.34
l_p,int, Pedestrian LOS Score for Intersectio	2.269	2.148	2.571	2.388
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	460	393	881	848
d_b, Bicycle Delay [s]	53.55	58.31	28.25	30.04
l_b,int, Bicycle LOS Score for Intersection	2.197	1.845	3.051	2.518
Bicycle LOS	B	A	C	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	37.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.796

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

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Version 2024 (SP 0-6) 2/4/2026

Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	97	1274	513	140	863	55	54	274	73	312	175	59
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	20	42	93	58	65	106	52	9	12	79	47	65
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	117	1316	606	198	928	161	106	283	85	391	222	124
Peak Hour Factor	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	30	335	154	50	236	41	27	72	22	99	56	32
Total Analysis Volume [veh/h]	119	1339	616	201	944	164	108	288	86	398	226	126
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			12		
v_di, Inbound Pedestrian Volume crossing m	0			12			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			48			64		
v_ci, Inbound Pedestrian Volume crossing mi	64			48			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			11			14		

Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.2	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.20	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	1.20	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	14	68	68	20	74	74	23	23	26	26	26
g / C, Green / Cycle	0.09	0.45	0.45	0.14	0.49	0.49	0.16	0.16	0.17	0.17	0.17
(v / s)_i Volume / Saturation Flow Rate	0.07	0.38	0.40	0.11	0.27	0.11	0.13	0.14	0.12	0.12	0.08
s, saturation flow rate [veh/h]	1781	3560	1522	1781	3560	1481	1830	1738	3459	1870	1510
c, Capacity [veh/h]	162	1603	685	242	1758	731	285	270	592	320	258
d1, Uniform Delay [s]	64.18	25.53	26.10	56.39	7.84	7.02	61.74	61.94	58.22	58.60	55.95
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.43	5.32	17.06	2.84	1.18	0.71	2.97	3.61	0.50	1.07	0.53
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.74	0.84	0.90	0.83	0.54	0.22	0.86	0.88	0.67	0.71	0.49
d, Delay for Lane Group [s/veh]	66.61	30.86	43.16	59.23	9.02	7.73	64.70	65.55	58.71	59.67	56.48
Lane Group LOS	E	C	D	E	A	A	E	E	E	E	E
Critical Lane Group	No	No	Yes	Yes	No	No	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.39	17.96	19.16	6.89	3.54	1.21	9.36	9.15	7.16	8.23	4.37
50th-Percentile Queue Length [ft/ln]	109.70	448.88	479.10	172.29	88.55	30.22	233.91	228.76	179.01	205.85	109.26
95th-Percentile Queue Length [veh/ln]	7.82	24.90	26.34	11.20	6.38	2.18	14.37	14.11	11.55	12.94	7.80
95th-Percentile Queue Length [ft/ln]	195.59	622.61	658.58	279.93	159.39	54.39	359.32	352.79	288.72	323.49	194.97

A221

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	66.61	30.86	43.16	59.23	9.02	7.73	64.70	65.15	65.55	58.71	59.67	56.48
Movement LOS	E	C	D	E	A	A	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	36.56			16.57			65.12			58.63		
Approach LOS	D			B			E			E		
d_I, Intersection Delay [s/veh]	37.46											
Intersection LOS	D											
Intersection V/C	0.796											

Emissions

Vehicle Miles Traveled [mph]	2.82	31.75	14.61	4.77	22.38	3.89	5.79	5.62	94.47	53.64	29.91
Stops [stops/h]	105.32	861.84	459.94	165.40	170.01	29.01	224.55	219.61	343.69	197.61	104.89
Fuel consumption [US gal/h]	2.51	16.10	9.43	3.85	3.87	0.62	4.70	4.61	10.54	6.04	3.26
CO [g/h]	175.63	1125.32	658.86	268.97	270.17	43.64	328.51	322.26	736.92	422.48	227.78
NOx [g/h]	34.17	218.95	128.19	52.33	52.56	8.49	63.92	62.70	143.38	82.20	44.32
VOC [g/h]	40.70	260.80	152.70	62.34	62.61	10.11	76.14	74.69	170.79	97.91	52.79

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.025	2.285	2.777
Crosswalk LOS	F	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.52	25.30	54.06	52.45
l_b,int, Bicycle LOS Score for Intersection	3.271	2.640	1.957	2.797
Bicycle LOS	C	B	A	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	31.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.685

Intersection Setup

Name	Middlefield Road				Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Middlefield Road				Ravenswood Avenue	
Base Volume Input [veh/h]	297	584	333	66	157	493
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	14	120	51	37	94	29
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	311	704	384	103	251	522
Peak Hour Factor	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	80	181	99	27	65	134
Total Analysis Volume [veh/h]	320	725	396	106	259	538
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		2	
v_di, Inbound Pedestrian Volume crossing m	2		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		12	
v_ci, Inbound Pedestrian Volume crossing mi	0		12		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	2		2		3	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	34	35	70	0	35	34
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	18	18	0	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	2.5	6.1	0.0	0.0	0.0	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	38	91	53	0	39	38
Lead / Lag	Lag	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	2.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	Yes	Yes		No	No
Pedestrian Recall	No	No	No		Yes	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.50	8.10	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.50	6.10	0.00	0.00	0.00
g_i, Effective Green Time [s]	26	86	61	34	65
g / C, Green / Cycle	0.20	0.66	0.47	0.26	0.50
(v / s)_i Volume / Saturation Flow Rate	0.18	0.39	0.28	0.15	0.34
s, saturation flow rate [veh/h]	1781	1870	1788	1781	1578
c, Capacity [veh/h]	361	1232	838	469	760
d1, Uniform Delay [s]	50.38	12.34	25.51	41.29	26.44
k, delay calibration	0.22	0.50	0.50	0.08	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	13.83	2.06	3.15	0.80	5.52
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.89	0.59	0.60	0.55	0.71
d, Delay for Lane Group [s/veh]	64.21	14.40	28.66	42.08	31.96
Lane Group LOS	E	B	C	D	C
Critical Lane Group	No	No	Yes	Yes	Yes
50th-Percentile Queue Length [veh/ln]	11.41	11.58	12.09	7.30	14.07
50th-Percentile Queue Length [ft/ln]	285.15	289.40	302.37	182.48	351.83
95th-Percentile Queue Length [veh/ln]	16.94	17.16	17.80	11.73	20.23
95th-Percentile Queue Length [ft/ln]	423.62	428.89	444.95	293.25	505.63

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	64.21	14.40	28.66	28.66	42.08	31.96
Movement LOS	E	B	C	C	D	C
d_A, Approach Delay [s/veh]	29.66		28.66		35.25	
Approach LOS	C		C		D	
d_I, Intersection Delay [s/veh]	31.34					
Intersection LOS	C					
Intersection V/C	0.685					

Emissions

Vehicle Miles Traveled [mph]	26.54	60.13	536.19	54.27	112.73
Stops [stops/h]	315.86	320.56	334.93	202.13	389.71
Fuel consumption [US gal/h]	7.57	6.83	26.85	5.57	10.29
CO [g/h]	529.00	477.27	1876.89	389.24	719.45
NOx [g/h]	102.92	92.86	365.17	75.73	139.98
VOC [g/h]	122.60	110.61	434.99	90.21	166.74

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.711	0.000	2.355
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1331	746	531
d_b, Bicycle Delay [s]	7.29	25.57	35.13
l_b,int, Bicycle LOS Score for Intersection	3.284	2.388	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	27.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.549

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street					
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	2	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			D Street					
Base Volume Input [veh/h]	1	667	125	319	507	1	19	17	9	68	1	190
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	105	1	5	74	2	24	72	0	1	5	5
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	772	126	324	581	3	43	89	9	69	6	195
Peak Hour Factor	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	196	32	82	147	1	11	23	2	18	2	49
Total Analysis Volume [veh/h]	1	783	128	329	589	3	44	90	9	70	6	198
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			1			0		
v_co, Outbound Pedestrian Volume crossing	5			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	11			2			0			8		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	10	35	35	10	50	0	35	35	35	50	35	50
Amber [s]	3.5	3.5	3.5	3.5	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.5	6.1	0.0	0.0	0.0	0.0	6.1	0.0	6.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	10	53	38	39	82	0	53	38	53	82	38	82
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	2.0	3.0	3.0	3.0	2.5	0.0	3.0	3.0	3.0	2.5	3.0	2.5
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	No			No			No	
Pedestrian Recall	No	No		Yes	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	130	130	130	130	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.50	8.10	8.10	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.50	6.10	6.10	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	3	70	70	28	89	89	26	26	26	26
g / C, Green / Cycle	0.02	0.54	0.54	0.21	0.69	0.69	0.20	0.20	0.20	0.20
(v / s)_i Volume / Saturation Flow Rate	0.00	0.22	0.08	0.18	0.16	0.16	0.04	0.05	0.08	0.13
s, saturation flow rate [veh/h]	1781	3560	1538	1781	1870	1866	1178	1840	948	1556
c, Capacity [veh/h]	37	1912	826	380	1284	1281	148	367	242	311
d1, Uniform Delay [s]	62.39	17.86	15.15	49.34	7.58	7.58	57.31	44.01	50.44	47.56
k, delay calibration	0.04	0.50	0.50	0.25	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.11	0.65	0.40	12.82	0.42	0.42	1.11	0.39	0.73	2.17
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.03	0.41	0.15	0.87	0.23	0.23	0.30	0.27	0.31	0.64
d, Delay for Lane Group [s/veh]	62.50	18.51	15.55	62.16	8.00	8.00	58.42	44.40	51.17	49.73
Lane Group LOS	E	B	B	E	A	A	E	D	D	D
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.03	7.01	1.99	11.56	3.04	3.04	1.45	2.81	2.31	6.07
50th-Percentile Queue Length [ft/ln]	0.83	175.19	49.69	289.03	76.04	75.91	36.36	70.20	57.79	151.74
95th-Percentile Queue Length [veh/ln]	0.06	11.35	3.58	17.14	5.47	5.47	2.62	5.05	4.16	10.11
95th-Percentile Queue Length [ft/ln]	1.50	283.73	89.43	428.43	136.86	136.64	65.45	126.37	104.02	252.74

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	62.50	18.51	15.55	62.16	8.00	8.00	58.42	44.40	44.40	51.17	51.17	49.73
Movement LOS	E	B	B	E	A	A	E	D	D	D	D	D
d_A, Approach Delay [s/veh]		18.14			27.35			48.71			50.13	
Approach LOS		B			C			D			D	
d_I, Intersection Delay [s/veh]	27.75											
Intersection LOS	C											
Intersection V/C	0.549											

Emissions

Vehicle Miles Traveled [mph]	0.16	124.21	20.31	27.28	24.57	24.53	2.97	6.68	63.89	166.46
Stops [stops/h]	0.92	388.12	55.04	320.15	84.22	84.09	40.28	77.76	64.01	168.08
Fuel consumption [US gal/h]	0.03	10.60	1.59	7.61	2.05	2.05	0.77	1.42	3.78	9.78
CO [g/h]	1.80	741.16	111.35	531.85	143.46	143.22	53.75	98.99	263.88	683.96
NOx [g/h]	0.35	144.20	21.66	103.48	27.91	27.87	10.46	19.26	51.34	133.07
VOC [g/h]	0.42	171.77	25.81	123.26	33.25	33.19	12.46	22.94	61.16	158.51

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	3.067	2.823	1.991	2.225
Crosswalk LOS	C	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	746	1192	515	515
d_b, Bicycle Delay [s]	25.69	10.61	35.82	35.96
l_b,int, Bicycle LOS Score for Intersection	2.312	2.319	1.796	2.012
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	56.5
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.749

Intersection Setup

Name	Middlefield Road			Middlefield Road						Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road						Willow Road		
Base Volume Input [veh/h]	71	376	294	195	304	3	31	230	156	353	63	304
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	3	16	36	39	34	0	0	124	34	112	88	70
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	74	392	330	234	338	3	31	354	190	465	151	374
Peak Hour Factor	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	102	86	61	88	1	8	92	50	121	39	98
Total Analysis Volume [veh/h]	77	409	344	244	353	3	32	369	198	485	158	390
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	8			5			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			8			5		
v_co, Outbound Pedestrian Volume crossing	4			1			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			1			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			2			16			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	45	0	30	30	30	0	40	0	45	45	45
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	38	0	29	29	29	0	40	0	34	34	34
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	0	5	0	5	5	5
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	141	141	141	141	141	141	141	141	141	141	141	141	141
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	24	24	24	24	19	19	19	30	30	30	49	49	49
g / C, Green / Cycle	0.17	0.17	0.17	0.17	0.13	0.13	0.13	0.21	0.21	0.21	0.35	0.35	0.35
(v / s)_i Volume / Saturation Flow Rate	0.04	0.14	0.15	0.15	0.11	0.11	0.11	0.02	0.20	0.13	0.18	0.18	0.25
s, saturation flow rate [veh/h]	1781	1870	1708	1544	1781	1848	1864	1781	1870	1527	1781	1824	1559
c, Capacity [veh/h]	307	323	295	267	237	246	248	382	401	327	623	637	545
d1, Uniform Delay [s]	50.44	56.44	56.59	56.47	59.52	59.49	59.48	44.31	54.21	49.71	36.39	36.21	39.52
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.42	5.81	6.91	8.32	7.08	6.67	6.59	0.09	16.51	1.80	3.04	2.84	7.83
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.25	0.84	0.85	0.87	0.82	0.82	0.82	0.08	0.92	0.60	0.52	0.50	0.72
d, Delay for Lane Group [s/veh]	50.87	62.25	63.50	64.79	66.61	66.16	66.07	44.41	70.72	51.51	39.44	39.04	47.35
Lane Group LOS	D	E	E	E	E	E	E	D	E	D	D	D	D
Critical Lane Group	No	No	No	Yes	Yes	No	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.41	9.87	9.27	8.59	7.28	7.49	7.54	0.92	14.66	6.47	9.47	9.40	12.97
50th-Percentile Queue Length [ft/ln]	60.31	246.8	231.6	214.8	182.08	187.15	188.51	22.97	366.48	161.80	236.80	235.05	324.21
95th-Percentile Queue Length [veh/ln]	4.34	15.02	14.26	13.40	11.71	11.97	12.04	1.65	20.94	10.64	14.52	14.43	18.87
95th-Percentile Queue Length [ft/ln]	108.5	375.6	356.4	335.0	292.72	299.33	301.10	41.34	523.46	266.10	362.98	360.76	471.86

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	50.87	62.67	64.42	66.53	66.11	66.07	44.41	70.72	51.51	39.31	39.04	47.35
Movement LOS	D	E	E	E	E	E	D	E	D	D	D	D
d_A, Approach Delay [s/veh]	62.28			66.28			62.96			42.30		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	56.46											
Intersection LOS	E											
Intersection V/C	0.749											

Emissions

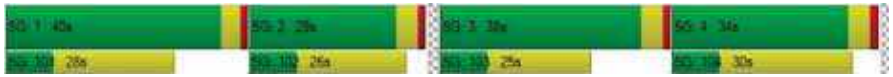
Vehicle Miles Traveled [mph]	1.83	6.42	5.96	5.48	63.44	65.47	66.00	13.38	154.26	82.77	139.46	139.46	169.18
Stops [stops/h]	61.60	252.0	236.5	219.4	185.95	191.14	192.52	23.46	374.28	165.24	241.84	240.05	331.11
Fuel consumption [US gal/h]	1.21	5.09	4.80	4.48	6.29	6.46	6.51	0.97	13.73	6.40	9.78	9.75	12.64
CO [g/h]	84.75	355.5	335.4	313.2	439.37	451.86	455.19	67.76	959.57	447.05	683.58	681.30	883.21
NOx [g/h]	16.49	69.18	65.26	60.95	85.49	87.91	88.56	13.18	186.70	86.98	133.00	132.56	171.84
VOC [g/h]	19.64	82.41	77.74	72.61	101.83	104.72	105.49	15.70	222.39	103.61	158.43	157.90	204.69

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.01	59.01	59.01	59.01
l_p,int, Pedestrian LOS Score for Intersectio	4.362	2.600	2.356	2.807
Crosswalk LOS	E	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	472	345	506	416
d_b, Bicycle Delay [s]	41.21	48.34	39.64	44.49
l_b,int, Bicycle LOS Score for Intersection	3.069	2.055	2.548	3.264
Bicycle LOS	C	B	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	17.2
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.770

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	57	39	125	30	32	7	3	776	26	42	692	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	8	0	2	0	0	0	0	173	26	16	262	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	65	39	127	30	32	7	3	949	52	58	954	8
Peak Hour Factor	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	17	10	34	8	9	2	1	255	14	16	257	2
Total Analysis Volume [veh/h]	70	42	137	32	34	8	3	1021	56	62	1026	9
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	5			1			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			1			5		
v_co, Outbound Pedestrian Volume crossing	5			6			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			5			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			13			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	69
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	5	24	5	24	24	24	60	60	60	60	60	60
Amber [s]	3.0	3.1	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	5	7	5	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	10	15	10	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	9	47	9	47	47	47	23	23	23	23	23	23
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	5	5	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	70	70	70	70	70	70	70	70
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	15	15	15	15	47	47	47	47
g / C, Green / Cycle	0.21	0.21	0.21	0.21	0.68	0.68	0.68	0.68
(v / s)_i Volume / Saturation Flow Rate	0.05	0.11	0.03	0.02	0.01	0.58	0.12	0.55
s, saturation flow rate [veh/h]	1362	1621	1200	1799	545	1849	524	1867
c, Capacity [veh/h]	310	335	189	371	249	1251	219	1263
d1, Uniform Delay [s]	26.53	24.78	31.01	22.57	18.84	8.77	24.02	8.22
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.37	1.33	0.42	0.13	0.09	7.90	3.21	6.03
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.23	0.54	0.17	0.11	0.01	0.86	0.28	0.82
d, Delay for Lane Group [s/veh]	26.90	26.11	31.43	22.71	18.92	16.67	27.22	14.25
Lane Group LOS	C	C	C	C	B	B	C	B
Critical Lane Group	No	Yes	No	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	1.05	2.69	0.53	0.56	0.04	12.18	1.07	10.61
50th-Percentile Queue Length [ft/ln]	26.26	67.21	13.19	14.05	1.03	304.51	26.84	265.36
95th-Percentile Queue Length [veh/ln]	1.89	4.84	0.95	1.01	0.07	17.90	1.93	15.96
95th-Percentile Queue Length [ft/ln]	47.26	120.99	23.74	25.29	1.85	447.60	48.32	398.94

A231

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.90	26.11	26.11	31.43	22.71	22.71	18.92	16.67	16.67	27.22	14.25	14.25
Movement LOS	C	C	C	C	C	C	B	B	B	C	B	B
d_A, Approach Delay [s/veh]	26.33			26.48			16.68			14.99		
Approach LOS	C			C			B			B		
d_I, Intersection Delay [s/veh]	17.19											
Intersection LOS	B											
Intersection V/C	0.770											

Emissions

Vehicle Miles Traveled [mph]	4.37	11.18	2.77	3.64	1.30	467.20	5.59	93.35
Stops [stops/h]	54.01	138.27	27.13	28.90	2.11	626.41	55.22	545.89
Fuel consumption [US gal/h]	0.79	1.98	0.43	0.47	0.08	27.07	0.81	9.29
CO [g/h]	55.01	138.70	30.29	32.75	5.46	1891.98	56.39	649.65
NOx [g/h]	10.70	26.99	5.89	6.37	1.06	368.11	10.97	126.40
VOC [g/h]	12.75	32.15	7.02	7.59	1.27	438.48	13.07	150.56

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.86	24.86	24.86	24.86
l_p,int, Pedestrian LOS Score for Intersectio	2.123	1.965	2.617	2.627
Crosswalk LOS	B	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1226	1226	540	540
d_b, Bicycle Delay [s]	5.25	5.25	18.77	18.69
l_b,int, Bicycle LOS Score for Intersection	1.970	1.682	3.342	3.370
Bicycle LOS	A	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	14.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.815

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	4	0	8	129	3	19	9	917	1	2	733	120
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	175	0	0	278	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	0	8	129	3	19	9	1092	1	2	1011	120
Peak Hour Factor	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	0	2	34	1	5	2	290	0	1	269	32
Total Analysis Volume [veh/h]	4	0	9	137	3	20	10	1161	1	2	1075	128
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	21			11			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			21			11		
v_co, Outbound Pedestrian Volume crossing	10			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			10		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			9			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	80.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	30	0	30	30	30	90	90	90	90	90	90
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	16	16	96	96	96	96
g / C, Green / Cycle	0.13	0.13	0.80	0.80	0.80	0.80
(v / s)_i Volume / Saturation Flow Rate	0.01	0.11	0.02	0.62	0.00	0.66
s, saturation flow rate [veh/h]	1708	1461	465	1870	483	1829
c, Capacity [veh/h]	268	252	237	1491	272	1459
d1, Uniform Delay [s]	45.34	50.21	23.49	6.50	19.00	7.19
k, delay calibration	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	2.65	0.33	4.09	0.05	5.43
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.05	0.64	0.04	0.78	0.01	0.82
d, Delay for Lane Group [s/veh]	45.42	52.86	23.82	10.59	19.05	12.62
Lane Group LOS	D	D	C	B	B	B
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.35	4.85	0.21	14.20	0.04	16.51
50th-Percentile Queue Length [ft/ln]	8.73	121.18	5.14	354.92	0.90	412.87
95th-Percentile Queue Length [veh/ln]	0.63	8.46	0.37	20.38	0.06	23.18
95th-Percentile Queue Length [ft/ln]	15.71	211.45	9.25	509.40	1.62	579.49

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	45.42	45.42	45.42	52.86	52.86	52.86	23.82	10.59	10.59	19.05	12.62	12.62
Movement LOS	D	D	D	D	D	D	C	B	B	B	B	B
d_A, Approach Delay [s/veh]	45.42			52.86			10.71			12.63		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	14.44											
Intersection LOS	B											
Intersection V/C	0.815											

Emissions

Vehicle Miles Traveled [mph]	0.37	3.80	0.90	104.80	0.59	354.97
Stops [stops/h]	10.47	145.42	6.16	425.90	1.08	495.45
Fuel consumption [US gal/h]	0.18	2.68	0.11	8.85	0.04	20.95
CO [g/h]	12.38	187.38	7.88	618.75	2.69	1464.67
NOx [g/h]	2.41	36.46	1.53	120.39	0.52	284.97
VOC [g/h]	2.87	43.43	1.83	143.40	0.62	339.45

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
l_p,int, Pedestrian LOS Score for Intersectio	1.739	1.888	2.575	2.850
Crosswalk LOS	A	A	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	432	432	1432	1432
d_b, Bicycle Delay [s]	36.91	36.91	4.87	4.85
l_b,int, Bicycle LOS Score for Intersection	1.581	1.824	3.493	3.548
Bicycle LOS	A	A	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	18.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.739

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	39	1	85	49	1	10	3	1098	12	33	813	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	5	0	4	8	167	0	0	274	12
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	39	1	85	54	1	14	11	1265	12	33	1087	29
Peak Hour Factor	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	0	22	14	0	4	3	322	3	8	277	7
Total Analysis Volume [veh/h]	40	1	87	55	1	14	11	1288	12	34	1107	30
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	11			2			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			11			2		
v_co, Outbound Pedestrian Volume crossing	13			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			13		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			8			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	108	108	108	108	108	108	108	108	108	108
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	11	11	4	4	4	1	73	73	3	74
g / C, Green / Cycle	0.10	0.10	0.04	0.04	0.04	0.01	0.67	0.67	0.02	0.68
(v / s)_i Volume / Saturation Flow Rate	0.02	0.06	0.02	0.02	0.01	0.01	0.35	0.35	0.02	0.61
s, saturation flow rate [veh/h]	1781	1509	1781	1784	1530	1781	1870	1863	1781	1860
c, Capacity [veh/h]	176	149	72	72	61	19	1255	1250	44	1274
d1, Uniform Delay [s]	45.13	46.85	50.83	50.83	50.48	53.51	9.02	9.03	52.69	13.87
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.23	0.11	0.31
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.65	3.69	3.46	3.44	1.86	26.36	0.71	0.72	25.16	6.43
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.23	0.59	0.39	0.39	0.23	0.59	0.52	0.52	0.78	0.89
d, Delay for Lane Group [s/veh]	45.78	50.54	54.29	54.28	52.34	79.87	9.74	9.75	77.85	20.30
Lane Group LOS	D	D	D	D	D	E	A	A	E	C
Critical Lane Group	No	Yes	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.03	2.44	0.83	0.84	0.41	0.44	7.50	7.48	1.23	22.28
50th-Percentile Queue Length [ft/ln]	25.86	61.07	20.87	20.88	10.31	10.93	187.47	187.08	30.79	557.06
95th-Percentile Queue Length [veh/ln]	1.86	4.40	1.50	1.50	0.74	0.79	11.99	11.97	2.22	30.02
95th-Percentile Queue Length [ft/ln]	46.55	109.93	37.57	37.58	18.55	19.67	299.75	299.23	55.43	750.60

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	45.78	50.54	50.54	54.28	54.28	52.34	79.87	9.74	9.75	77.85	20.30	20.30
Movement LOS	D	D	D	D	D	D	E	A	A	E	C	C
d_A, Approach Delay [s/veh]	49.05			53.89			10.33			21.97		
Approach LOS	D			D			B			C		
d_I, Intersection Delay [s/veh]	18.40											
Intersection LOS	B											
Intersection V/C	0.739											

Emissions

Vehicle Miles Traveled [mph]	1.82	3.99	0.93	0.93	0.47	3.25	192.07	191.52	4.36	145.66
Stops [stops/h]	34.33	81.06	27.70	27.71	13.68	14.50	248.83	248.31	40.87	739.40
Fuel consumption [US gal/h]	0.59	1.40	0.38	0.38	0.19	0.38	10.88	10.85	0.89	14.08
CO [g/h]	40.96	97.55	26.76	26.77	12.99	26.59	760.62	758.59	62.30	984.47
NOx [g/h]	7.97	18.98	5.21	5.21	2.53	5.17	147.99	147.59	12.12	191.54
VOC [g/h]	9.49	22.61	6.20	6.20	3.01	6.16	176.28	175.81	14.44	228.16

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	43.80	43.80	43.80	43.80
l_p,int, Pedestrian LOS Score for Intersectio	1.996	2.149	2.642	2.814
Crosswalk LOS	A	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	553	553	369	369
d_b, Bicycle Delay [s]	28.41	28.39	36.23	36.14
l_b,int, Bicycle LOS Score for Intersection	1.771	1.675	2.641	3.492
Bicycle LOS	A	A	B	C

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	19.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.916

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	462	34	19	1374	917	214
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	83	0	0	172	286	20
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	545	34	19	1546	1203	234
Peak Hour Factor	0.9590	0.9590	0.9590	0.9590	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	142	9	5	403	314	61
Total Analysis Volume [veh/h]	568	35	20	1612	1254	244
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	2		0		1	
v_ci, Inbound Pedestrian Volume crossing mi	1		0		2	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	3		10		6	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	31	31
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	40	13	100	87	87
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	70	70	70	70	70	70
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	24	24	1	36	31	31
g / C, Green / Cycle	0.35	0.35	0.02	0.52	0.45	0.45
(v / s)_i Volume / Saturation Flow Rate	0.32	0.02	0.01	0.45	0.35	0.16
s, saturation flow rate [veh/h]	1781	1567	1781	3560	3560	1550
c, Capacity [veh/h]	616	543	33	1833	1589	691
d1, Uniform Delay [s]	21.92	15.26	34.01	15.01	16.53	12.65
k, delay calibration	0.12	0.04	0.04	0.15	0.15	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.70	0.02	6.36	2.12	1.29	0.44
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.92	0.06	0.60	0.88	0.79	0.35
d, Delay for Lane Group [s/veh]	28.62	15.28	40.37	17.13	17.82	13.09
Lane Group LOS	C	B	D	B	B	B
Critical Lane Group	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	9.30	0.35	0.38	10.11	7.64	2.28
50th-Percentile Queue Length [ft/ln]	232.52	8.82	9.61	252.77	191.11	56.89
95th-Percentile Queue Length [veh/ln]	14.30	0.63	0.69	15.33	12.18	4.10
95th-Percentile Queue Length [ft/ln]	357.56	15.87	17.30	383.14	304.47	102.40

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	28.62	15.28	40.37	17.13	17.82	13.09
Movement LOS	C	B	D	B	B	B
d_A, Approach Delay [s/veh]	27.85		17.41		17.05	
Approach LOS	C		B		B	
d_I, Intersection Delay [s/veh]	18.95					
Intersection LOS	B					
Intersection V/C	0.916					

Emissions

Vehicle Miles Traveled [mph]	415.70	25.62	2.56	206.51	131.76	25.64
Stops [stops/h]	480.70	18.22	19.87	1045.12	790.17	117.61
Fuel consumption [US gal/h]	23.08	1.26	0.38	19.89	15.51	2.51
CO [g/h]	1613.08	88.36	26.53	1390.64	1084.36	175.56
NOx [g/h]	313.85	17.19	5.16	270.57	210.98	34.16
VOC [g/h]	373.85	20.48	6.15	322.29	251.31	40.69

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.70	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.208	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1028	2713	2340
d_b, Bicycle Delay [s]	8.24	4.45	1.01
l_b,int, Bicycle LOS Score for Intersection	1.560	2.906	2.795
Bicycle LOS	A	C	C

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	63.8
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.336

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	516	0	320	0	1416	359	0	845	694	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	156	0	6	0	239	16	0	300	781	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	672	0	326	0	1655	375	0	1145	1475	0	0	0
Peak Hour Factor	0.9624	1.0000	0.9624	1.0000	0.9624	0.9624	1.0000	0.9624	0.9624	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	175	0	85	0	430	97	0	297	383	0	0	0
Total Analysis Volume [veh/h]	698	0	339	0	1720	390	0	1190	1533	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			14			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	14			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			5			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	33	0	0	0	112	0	0	112	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	5	0	0	5	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				Yes			Yes				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	145	145	145	145	145	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
I2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	29	29	108	108	108	
g / C, Green / Cycle	0.20	0.20	0.74	0.74	0.74	
(v / s)_i Volume / Saturation Flow Rate	0.20	0.12	0.34	0.23	0.99	
s, saturation flow rate [veh/h]	3459	2754	5094	5094	1554	
c, Capacity [veh/h]	692	551	3794	3794	1157	
d1, Uniform Delay [s]	58.00	52.76	7.13	6.16	17.36	
k, delay calibration	0.11	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	18.15	1.12	0.39	0.22	152.19	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	1.01	0.62	0.45	0.31	1.32	
d, Delay for Lane Group [s/veh]	76.15	53.88	7.52	6.38	169.55	
Lane Group LOS	F	D	A	A	F	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	14.43	5.74	6.54	3.90	80.39	
50th-Percentile Queue Length [ft/ln]	360.69	143.50	163.45	97.57	2009.78	
95th-Percentile Queue Length [veh/ln]	20.76	9.67	10.73	7.03	118.63	
95th-Percentile Queue Length [ft/ln]	519.00	241.73	268.29	175.63	2965.84	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	76.15	0.00	53.88	0.00	7.52	0.00	0.00	6.38	169.55	0.00	0.00	0.00
Movement LOS	F		D		A			A	F			
d_A, Approach Delay [s/veh]	68.87			6.17			98.24			0.00		
Approach LOS	E			A			F			A		
d_I, Intersection Delay [s/veh]	63.79											
Intersection LOS	E											
Intersection V/C	1.336											

Emissions

Vehicle Miles Traveled [mph]	16.56	8.04	180.73	130.68	168.35	
Stops [stops/h]	716.40	285.02	486.97	290.70	1995.92	
Fuel consumption [US gal/h]	15.45	5.62	12.76	8.53	70.84	
CO [g/h]	1080.30	392.99	892.12	596.25	4951.82	
NOx [g/h]	210.19	76.46	173.57	116.01	963.44	
VOC [g/h]	250.37	91.08	206.76	138.19	1147.63	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	63.78	0.00	63.78
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.070	0.000	1.447
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	400	1490	1490	0
d_b, Bicycle Delay [s]	46.40	4.72	4.73	72.50
l_b,int, Bicycle LOS Score for Intersection	1.560	2.506	3.057	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	171.9
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.912

Intersection Setup

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	200.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	270	0	964	0	0	0	0	1623	385	0	1101	313
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	15	0	290	0	0	0	0	392	3	0	1066	270
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	285	0	1254	0	0	0	0	2015	388	0	2167	583
Peak Hour Factor	0.9741	1.0000	0.9741	1.0000	1.0000	1.0000	1.0000	0.9741	0.9741	1.0000	0.9741	0.9741
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	73	0	322	0	0	0	0	517	100	0	556	150
Total Analysis Volume [veh/h]	293	0	1287	0	0	0	0	2069	398	0	2225	599
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	2.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	7	0	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	30	0	0	16	0	0	16	0
Amber [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	5	0	5	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	10	0	10	0	10	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No			No	
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	25	0	25	0	25	0	0	95	0	0	95	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	5	0	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No		No			No			No	
Maximum Recall	No		No		No			No			No	
Pedestrian Recall	No		No		No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	R	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	21	46	21	91	91	116	91
g / C, Green / Cycle	0.14	0.32	0.14	0.63	0.63	0.80	0.63
(v / s)_i Volume / Saturation Flow Rate	0.11	0.78	0.00	0.69	0.25	0.74	0.64
s, saturation flow rate [veh/h]	2752	1658	1870	3003	1589	3003	937
c, Capacity [veh/h]	410	526	296	1884	998	2402	588
d1, Uniform Delay [s]	59.42	49.50	0.00	27.00	13.41	11.20	27.00
k, delay calibration	0.11	0.50	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.33	656.53	0.00	52.98	1.19	7.65	41.89
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.71	2.45	0.00	1.10	0.40	0.93	1.02
d, Delay for Lane Group [s/veh]	61.75	706.03	0.00	79.98	14.61	18.85	68.89
Lane Group LOS	E	F	A	F	B	B	F
Critical Lane Group	No	Yes	No	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	5.31	57.46	0.00	29.68	6.76	16.51	25.97
50th-Percentile Queue Length [ft/ln]	132.78	1436.46	0.00	742.00	169.08	412.76	649.33
95th-Percentile Queue Length [veh/ln]	9.09	94.99	0.00	41.67	11.03	23.17	34.88
95th-Percentile Queue Length [ft/ln]	227.27	2374.87	0.00	1041.83	275.71	579.35	872.07

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	61.75	0.00	706.03	0.00	0.00	0.00	0.00	79.98	14.61	0.00	18.85	68.89
Movement LOS	E		F	A	A	A		F	B		B	F
d_A, Approach Delay [s/veh]	586.56			0.00			69.43			29.46		
Approach LOS	F			A			E			C		
d_I, Intersection Delay [s/veh]	171.92											
Intersection LOS	F											
Intersection V/C	0.912											

Emissions

Vehicle Miles Traveled [mph]	6.95	30.51	0.00	227.21	43.71	52.59	14.16
Stops [stops/h]	263.74	2853.11	0.00	2210.64	167.92	1229.73	644.85
Fuel consumption [US gal/h]	5.42	201.89	0.00	55.24	3.91	17.49	12.54
CO [g/h]	379.17	14111.80	0.00	3861.07	273.31	1222.71	876.72
NOx [g/h]	73.77	2745.64	0.00	751.22	53.18	237.90	170.58
VOC [g/h]	87.88	3270.55	0.00	894.84	63.34	283.38	203.19

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	9.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.78	63.78	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.710	2.031	0.000	0.000
Crosswalk LOS	B	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	290	290	1255	1600
d_b, Bicycle Delay [s]	53.02	53.02	10.06	2.90
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.916	3.113
Bicycle LOS	A	A	C	C

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.AM.vistro
Report File: C:\...\C AM.pdf

Scenario 19 Cumulative AM
2/10/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road and US 101 NB Ramps	Signalized	HCM 7th Edition	NB Thru	1.024	34.6	C
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	EB Left	0.924	43.3	D
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	SB Left	0.807	31.3	C
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	NB Left	0.873	70.9	E
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	EB Left	0.999	33.5	C
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	NB Thru	0.726	56.5	E
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	EB Right	0.826	61.9	E
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	SB Thru	0.874	37.0	D
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	NB Left	0.626	53.0	D
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	EB Thru	0.736	59.0	E
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	SB Left	0.698	17.2	B
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.888	25.7	C
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	NB Right	1.124	114.1	F
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	WB Right	1.254	133.5	F
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	2.031	138.5	F
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	1.208	88.0	F

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V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road and US 101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	34.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.024

Intersection Setup

Name	Marsh Road		Marsh Road		US 101 NB Off-Ramp	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

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Volumes

Name	Marsh Road		Marsh Road		US 101 NB Off-Ramp	
Base Volume Input [veh/h]	2047	0	0	933	734	952
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2047	0	0	933	734	952
Peak Hour Factor	0.9670	1.0000	1.0000	0.9670	0.9670	0.9670
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	529	0	0	241	190	246
Total Analysis Volume [veh/h]	2117	0	0	965	759	984
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	1		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	2		0		1	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	3		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	60	0	0	60	60	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	30	0	0	30	60	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	No	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	51	51	34	34
g / C, Green / Cycle	0.57	0.57	0.38	0.38
(v / s)_i Volume / Saturation Flow Rate	0.59	0.27	0.22	0.35
s, saturation flow rate [veh/h]	3560	3560	3459	2813
c, Capacity [veh/h]	2026	2026	1317	1071
d1, Uniform Delay [s]	19.39	11.46	22.10	26.53
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	32.84	0.80	0.15	1.45
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.04	0.48	0.58	0.92
d, Delay for Lane Group [s/veh]	52.22	12.26	22.25	27.98
Lane Group LOS	F	B	C	C
Critical Lane Group	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	27.75	5.44	6.16	9.76
50th-Percentile Queue Length [ft/ln]	693.87	135.94	153.94	243.92
95th-Percentile Queue Length [veh/ln]	37.73	9.26	10.23	14.88
95th-Percentile Queue Length [ft/ln]	943.17	231.54	255.68	371.99

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	52.22	0.00	0.00	12.26	22.25	27.98
Movement LOS	F			B	C	C
d_A, Approach Delay [s/veh]	52.22		12.26		25.49	
Approach LOS	D		B		C	
d_I, Intersection Delay [s/veh]	34.57					
Intersection LOS	C					
Intersection V/C	1.024					

Emissions

Vehicle Miles Traveled [mph]	50.05	22.81	18.00	23.33
Stops [stops/h]	2220.39	434.99	492.61	780.54
Fuel consumption [US gal/h]	36.82	5.75	6.90	10.88
CO [g/h]	2574.03	402.00	482.25	760.26
NOx [g/h]	500.81	78.22	93.83	147.92
VOC [g/h]	596.56	93.17	111.77	176.20

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	36.45	34.67
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.124	2.555
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	564	564	1240
d_b, Bicycle Delay [s]	23.22	23.18	6.50
l_b,int, Bicycle LOS Score for Intersection	3.306	2.356	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	43.3
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.924

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	1107	1476	217	1393	500
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1107	1476	217	1393	500
Peak Hour Factor	1.0000	0.9590	0.9590	1.0000	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	289	385	54	363	130
Total Analysis Volume [veh/h]	0	1154	1539	217	1453	521
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	2		1		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	60	60	0	35	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	10	0	5	0
Pedestrian Clearance [s]	0	16	0	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	55	55	0	35	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	53	50	33	33
g / C, Green / Cycle	0.58	0.56	0.37	0.37
(v / s)_i Volume / Saturation Flow Rate	0.29	0.43	0.42	0.33
s, saturation flow rate [veh/h]	4000	3560	3459	1589
c, Capacity [veh/h]	2333	1994	1268	583
d1, Uniform Delay [s]	10.98	15.34	28.50	26.85
k, delay calibration	0.50	0.50	0.08	0.36
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.75	2.97	67.27	14.25
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.49	0.77	1.15	0.89
d, Delay for Lane Group [s/veh]	11.73	18.31	95.77	41.10
Lane Group LOS	B	B	F	D
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	6.17	11.51	24.81	12.34
50th-Percentile Queue Length [ft/ln]	154.22	287.87	620.32	308.58
95th-Percentile Queue Length [veh/ln]	10.24	17.08	36.03	18.10
95th-Percentile Queue Length [ft/ln]	256.05	427.00	900.66	452.62

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	11.73	18.31	0.00	95.77	41.10
Movement LOS		B	B		F	D
d_A, Approach Delay [s/veh]	11.73		18.31		81.34	
Approach LOS	B		B		F	
d_I, Intersection Delay [s/veh]	43.35					
Intersection LOS	D					
Intersection V/C	0.924					

Emissions

Vehicle Miles Traveled [mph]	27.34	36.47	34.36	12.32
Stops [stops/h]	493.49	921.19	1985.01	493.73
Fuel consumption [US gal/h]	7.51	14.05	40.70	7.59
CO [g/h]	524.89	982.38	2844.62	530.72
NOx [g/h]	102.12	191.14	553.46	103.26
VOC [g/h]	121.65	227.68	659.27	123.00

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.45	0.00	32.09
l_p,int, Pedestrian LOS Score for Intersectio	3.047	0.000	2.609
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1120	1120	687
d_b, Bicycle Delay [s]	8.72	8.72	19.40
l_b,int, Bicycle LOS Score for Intersection	2.512	2.829	1.560
Bicycle LOS	B	C	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	31.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.807

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	1	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Base Volume Input [veh/h]	60	1522	9	274	1412	358	297	8	2	15	5	175
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	60	1522	9	274	1412	358	297	8	2	15	5	175
Peak Hour Factor	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	399	2	72	370	94	78	2	1	4	1	46
Total Analysis Volume [veh/h]	63	1595	9	287	1480	375	311	8	2	16	5	183
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			1			1			2		
v_di, Inbound Pedestrian Volume crossing m	1			2			2			1		
v_co, Outbound Pedestrian Volume crossing	1			0			0			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			0			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	135
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	4	4	8	3	8
Auxiliary Signal Groups												
Maximum Green [s]	15	60	60	20	65	65	40	40	40	0	40	0
Amber [s]	3.0	4.0	4.0	3.0	4.0	4.0	3.2	3.2	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	8	8	8	0	8	0
Pedestrian Clearance [s]	0	21	21	0	21	21	24	24	24	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	85	85	14	79	79	20	20	20	0	16	0
Lead / Lag	Lead	-	-	Lead	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	10	10	4	10	10	4	4	4	0	6	0
Vehicle Extension [s]	2.5	3.5	3.5	2.0	3.5	3.5	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	135	135	135	135	135	135	135	135	135	135
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	4.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	8	84	84	10	88	88	17	17	14	14
g / C, Green / Cycle	0.06	0.62	0.62	0.07	0.65	0.65	0.13	0.13	0.10	0.10
(v / s)_i Volume / Saturation Flow Rate	0.04	0.30	0.30	0.08	0.50	0.53	0.09	0.09	0.01	0.07
s, saturation flow rate [veh/h]	1781	3560	1865	3459	1870	1745	1781	1782	1801	2750
c, Capacity [veh/h]	108	2214	1160	256	1216	1135	225	225	187	285
d1, Uniform Delay [s]	61.73	13.70	13.70	62.50	16.40	17.64	56.64	56.64	54.87	58.00
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.65	0.73	1.40	58.94	4.57	6.58	3.13	3.12	0.20	1.79
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.58	0.48	0.48	1.12	0.76	0.82	0.71	0.71	0.11	0.64
d, Delay for Lane Group [s/veh]	65.38	14.43	15.10	121.44	20.97	24.21	59.76	59.76	55.06	59.79
Lane Group LOS	E	B	B	F	C	C	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.21	8.49	9.11	6.47	19.93	21.85	5.50	5.51	0.67	3.10
50th-Percentile Queue Length [ft/ln]	55.20	212.37	227.81	161.76	498.27	546.21	137.60	137.71	16.70	77.51
95th-Percentile Queue Length [veh/ln]	3.97	13.27	14.06	11.04	27.25	29.51	9.35	9.36	1.20	5.58
95th-Percentile Queue Length [ft/ln]	99.36	331.87	351.57	275.95	681.31	737.85	233.79	233.93	30.05	139.51

A252

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	65.38	14.66	15.10	121.44	22.18	24.21	59.76	59.76	59.76	55.06	55.06	59.79
Movement LOS	E	B	B	F	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	16.58			35.84			59.76			59.30		
Approach LOS	B			D			E			E		
d_I, Intersection Delay [s/veh]	31.30											
Intersection LOS	C											
Intersection V/C	0.807											

Emissions

Vehicle Miles Traveled [mph]	12.98	216.87	113.58	6.80	21.97	21.97	4.84	4.84	1.43	12.45
Stops [stops/h]	58.88	453.06	242.99	345.09	531.48	582.63	146.78	146.89	17.81	165.35
Fuel consumption [US gal/h]	1.78	14.77	7.85	9.95	8.79	9.79	2.73	2.73	0.37	3.42
CO [g/h]	124.12	1032.12	548.77	695.21	614.59	684.26	190.94	191.07	25.71	239.08
NOx [g/h]	24.15	200.81	106.77	135.26	119.58	133.13	37.15	37.18	5.00	46.52
VOC [g/h]	28.77	239.20	127.18	161.12	142.44	158.58	44.25	44.28	5.96	55.41

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.03	56.03	56.95	56.95
l_p,int, Pedestrian LOS Score for Intersectio	3.127	3.300	2.167	2.402
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1185	1096	234	175
d_b, Bicycle Delay [s]	11.20	13.78	52.62	56.24
l_b,int, Bicycle LOS Score for Intersection	2.476	3.327	2.089	1.896
Bicycle LOS	B	C	B	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	70.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.873

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Base Volume Input [veh/h]	281	1104	120	28	1141	396	537	54	195	57	66	21
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	281	1104	120	28	1141	396	537	54	195	57	66	21
Peak Hour Factor	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	74	290	31	7	299	104	141	14	51	15	17	6
Total Analysis Volume [veh/h]	295	1158	126	29	1197	416	563	57	205	60	69	22
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1			2			1			1		
v_di, Inbound Pedestrian Volume crossing m	1			1			1			2		
v_co, Outbound Pedestrian Volume crossing	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			0			6			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	155
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	20	80	80	18	72	72	35	35	35	0	35	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	58	58	15	58	58	37	45	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	155	155	155	155	155	155	155	155	155	155	155
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	13	96	96	5	88	88	32	32	32	14	14
g / C, Green / Cycle	0.08	0.62	0.62	0.03	0.57	0.57	0.21	0.21	0.21	0.09	0.09
(v / s)_i Volume / Saturation Flow Rate	0.17	0.35	0.35	0.02	0.44	0.46	0.17	0.17	0.13	0.03	0.05
s, saturation flow rate [veh/h]	1781	1870	1798	1781	1870	1710	1781	1797	1556	1781	1788
c, Capacity [veh/h]	149	1160	1115	60	1066	975	368	371	321	156	157
d1, Uniform Delay [s]	71.00	17.11	17.28	73.53	25.62	26.52	59.06	59.01	56.03	66.74	67.95
k, delay calibration	0.50	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	461.93	1.95	2.11	2.19	5.49	7.15	3.94	3.82	1.57	1.15	2.50
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.97	0.56	0.57	0.48	0.77	0.81	0.84	0.84	0.64	0.38	0.58
d, Delay for Lane Group [s/veh]	532.93	19.06	19.39	75.72	31.12	33.66	63.01	62.83	57.60	67.89	70.46
Lane Group LOS	F	B	B	E	C	C	E	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	25.09	13.75	13.63	1.17	24.36	24.36	12.20	12.23	7.56	2.32	3.62
50th-Percentile Queue Length [ft/ln]	627.25	343.82	340.73	29.29	609.00	608.92	304.93	305.81	188.92	58.11	90.54
95th-Percentile Queue Length [veh/ln]	39.72	19.83	19.68	2.11	32.45	32.45	17.92	17.97	12.06	4.18	6.52
95th-Percentile Queue Length [ft/ln]	993.05	495.86	492.09	52.72	811.36	811.26	448.12	449.20	301.62	104.60	162.98

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	532.93	19.21	19.39	75.72	31.91	33.66	62.93	62.83	57.60	67.89	70.46	70.46
Movement LOS	F	B	B	E	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	115.20			33.13			61.60			69.44		
Approach LOS	F			C			E			E		
d_I, Intersection Delay [s/veh]	70.91											
Intersection LOS	E											
Intersection V/C	0.873											

Emissions

Vehicle Miles Traveled [mph]	46.30	101.84	99.70	5.97	170.14	162.17	35.80	35.97	23.73	3.39	5.14
Stops [stops/h]	582.73	319.42	316.54	27.21	565.78	565.70	283.29	284.10	175.51	53.99	84.12
Fuel consumption [US gal/h]	38.13	8.80	8.69	0.88	15.97	15.83	6.66	6.68	4.14	1.19	1.86
CO [g/h]	2665.46	615.16	607.24	61.45	1116.30	1106.36	465.65	466.90	289.61	83.05	129.88
NOx [g/h]	518.60	119.69	118.15	11.96	217.19	215.26	90.60	90.84	56.35	16.16	25.27
VOC [g/h]	617.75	142.57	140.73	14.24	258.71	256.41	107.92	108.21	67.12	19.25	30.10

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	66.89	66.89	66.89	66.89
l_p,int, Pedestrian LOS Score for Intersectio	3.055	3.120	2.483	2.064
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	689	689	529	423
d_b, Bicycle Delay [s]	33.33	33.30	42.05	48.17
l_b,int, Bicycle LOS Score for Intersection	2.862	2.914	2.921	1.809
Bicycle LOS	C	C	C	A

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	33.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.999

Intersection Setup

Name	Marsh Road			Marsh Road			Bay Road			Bay Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Bay Road			Bay Road		
Base Volume Input [veh/h]	0	946	72	324	978	62	193	44	1	54	49	385
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	946	72	324	978	62	193	44	1	54	49	385
Peak Hour Factor	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	250	19	86	258	16	51	12	0	14	13	102
Total Analysis Volume [veh/h]	0	999	76	342	1033	65	204	46	1	57	52	407
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			5			0			5		
v_di, Inbound Pedestrian Volume crossing m	0			5			0			5		
v_co, Outbound Pedestrian Volume crossing	1			1			1			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			1			1			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			3			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	8.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	7	0	7	0	7	0	7	7	7	0	7	0
Pedestrian Clearance [s]	17	0	17	0	17	0	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	56	34	56	22	56	34	34	34	34	0	34	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
I2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	32	32	19	54	54	32	32
g / C, Green / Cycle	0.35	0.35	0.21	0.59	0.59	0.35	0.35
(v / s)_i Volume / Saturation Flow Rate	0.30	0.31	0.19	0.30	0.30	0.46	0.30
s, saturation flow rate [veh/h]	1870	1651	1781	1870	1826	550	1729
c, Capacity [veh/h]	694	578	376	1112	1085	267	657
d1, Uniform Delay [s]	27.34	27.40	34.66	10.51	10.55	34.08	26.93
k, delay calibration	0.50	0.50	0.15	0.50	0.50	0.50	0.44
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	10.48	16.74	11.50	1.59	1.66	41.24	8.15
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.82	0.87	0.91	0.50	0.50	0.94	0.79
d, Delay for Lane Group [s/veh]	37.83	44.14	46.17	12.11	12.21	75.31	35.08
Lane Group LOS	D	D	D	B	B	E	D
Critical Lane Group	No	Yes	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	12.79	12.25	8.23	6.02	5.95	8.67	11.23
50th-Percentile Queue Length [ft/ln]	319.72	306.33	205.82	150.42	148.87	216.79	280.82
95th-Percentile Queue Length [veh/ln]	18.65	17.99	12.94	10.04	9.96	13.50	16.73
95th-Percentile Queue Length [ft/ln]	466.35	449.84	323.46	250.99	248.92	337.52	418.23

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	37.83	40.54	44.14	46.17	12.15	12.21	75.31	75.31	75.31	35.08	35.08	35.08
Movement LOS	D	D	D	D	B	B	E	E	E	D	D	D
d_A, Approach Delay [s/veh]	40.79			20.23			75.31			35.08		
Approach LOS	D			C			E			D		
d_I, Intersection Delay [s/veh]	33.51											
Intersection LOS	C											
Intersection V/C	0.999											

Emissions

Vehicle Miles Traveled [mph]	13.47	11.95	53.68	86.87	85.48	19.51	12.24
Stops [stops/h]	511.56	490.12	329.31	240.67	238.19	346.86	449.31
Fuel consumption [US gal/h]	8.75	8.68	7.74	6.48	6.40	6.05	6.67
CO [g/h]	611.38	606.69	540.72	453.27	447.53	423.19	466.25
NOx [g/h]	118.95	118.04	105.20	88.19	87.07	82.34	90.72
VOC [g/h]	141.69	140.61	125.32	105.05	103.72	98.08	108.06

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	28.9
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	20.74
l_p,int, Pedestrian LOS Score for Intersectio	2.828	3.283	1.864	2.172
Crosswalk LOS	C	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	642	1131	651	651
d_b, Bicycle Delay [s]	20.75	8.50	20.50	20.49
l_b,int, Bicycle LOS Score for Intersection	2.446	2.748	1.974	2.411
Bicycle LOS	B	B	A	B

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	56.5
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.726

Intersection Setup

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	245	187	64	88	244	55	25	476	118	20	483	41
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	245	187	64	88	244	55	25	476	118	20	483	41
Peak Hour Factor	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	65	50	17	23	65	15	7	127	31	5	129	11
Total Analysis Volume [veh/h]	261	199	68	94	260	59	27	508	126	21	515	44
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	18			18			18			19		
v_di, Inbound Pedestrian Volume crossing m	19			18			18			18		
v_co, Outbound Pedestrian Volume crossing	26			21			25			20		
v_ci, Inbound Pedestrian Volume crossing mi	25			20			26			21		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	11			37			52			17		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	26	30	26	30	26	20	71	71	20	71	71
Amber [s]	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	28	28	28	28	28	28	10	44	44	10	44	44
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	5	4	4	5	5	5
Vehicle Extension [s]	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	Yes		No	Yes	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	149	149	149	149	149	149	149	149
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	0.00	2.70	0.00	2.70
g_i, Effective Green Time [s]	26	26	30	30	79	71	79	71
g / C, Green / Cycle	0.17	0.17	0.20	0.20	0.53	0.48	0.53	0.48
(v / s)_i Volume / Saturation Flow Rate	0.15	0.16	0.05	0.18	0.03	0.36	0.02	0.31
s, saturation flow rate [veh/h]	1781	1707	1781	1736	923	1757	865	1831
c, Capacity [veh/h]	310	297	358	349	363	841	295	871
d1, Uniform Delay [s]	59.66	60.36	50.32	58.40	20.92	31.75	23.45	29.56
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	23.25	31.65	1.78	30.70	0.40	6.20	0.10	3.63
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.84	0.90	0.26	0.91	0.07	0.75	0.07	0.64
d, Delay for Lane Group [s/veh]	82.90	92.01	52.10	89.09	21.32	37.95	23.55	33.18
Lane Group LOS	F	F	D	F	C	D	C	C
Critical Lane Group	No	Yes	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	11.59	12.54	3.20	14.88	0.49	20.02	0.36	16.04
50th-Percentile Queue Length [ft/ln]	289.74	313.38	80.01	371.99	12.37	500.40	9.02	401.10
95th-Percentile Queue Length [veh/ln]	17.17	18.34	5.76	21.21	0.89	27.35	0.65	22.61
95th-Percentile Queue Length [ft/ln]	429.31	458.54	144.01	530.15	22.27	683.84	16.24	565.32

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	82.90	92.01	92.01	52.10	89.09	89.09	21.32	37.95	37.95	23.55	33.18	33.18
Movement LOS	F	F	F	D	F	F	C	D	D	C	C	C
d_A, Approach Delay [s/veh]	87.51			80.67			37.27			32.84		
Approach LOS	F			F			D			C		
d_I, Intersection Delay [s/veh]	56.46											
Intersection LOS	E											
Intersection V/C	0.726											

Emissions

Vehicle Miles Traveled [mph]	6.18	6.33	2.23	7.56	0.64	15.00	0.50	13.23
Stops [stops/h]	279.57	302.39	77.20	358.94	11.94	482.85	8.70	387.03
Fuel consumption [US gal/h]	6.20	6.93	1.39	7.50	0.21	8.18	0.17	6.46
CO [g/h]	433.51	484.38	97.37	524.24	14.64	571.87	11.83	451.38
NOx [g/h]	84.34	94.24	18.94	102.00	2.85	111.27	2.30	87.82
VOC [g/h]	100.47	112.26	22.57	121.50	3.39	132.54	2.74	104.61

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	64.02	64.02	64.02	64.02
l_p,int, Pedestrian LOS Score for Intersectio	2.283	2.168	2.450	2.371
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	312	312	527	527
d_b, Bicycle Delay [s]	53.43	54.14	41.57	40.84
l_b,int, Bicycle LOS Score for Intersection	2.431	2.241	2.650	2.517
Bicycle LOS	B	B	B	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



A260

Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	61.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.826

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	176	1025	297	144	1133	69	153	395	83	436	256	110
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	176	1025	297	144	1133	69	153	395	83	436	256	110
Peak Hour Factor	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	48	281	82	40	311	19	42	108	23	120	70	30
Total Analysis Volume [veh/h]	193	1125	326	158	1244	76	168	434	91	479	281	121
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			10			0			10		
v_di, Inbound Pedestrian Volume crossing m	0			10			0			10		
v_co, Outbound Pedestrian Volume crossing	0			11			12			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			12			11			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			4			41			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.0	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	Yes	Yes		Yes	Yes			Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes			No			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.00	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	1.00	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	17	60	60	24	67	67	24	24	29	29	29
g / C, Green / Cycle	0.11	0.40	0.40	0.16	0.45	0.45	0.16	0.16	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.11	0.32	0.21	0.09	0.35	0.05	0.19	0.20	0.14	0.15	0.08
s, saturation flow rate [veh/h]	1781	3560	1570	1781	3560	1512	1826	1748	3459	1870	1503
c, Capacity [veh/h]	202	1422	627	285	1588	675	292	280	669	362	291
d1, Uniform Delay [s]	63.30	30.02	25.69	50.40	14.80	10.92	63.00	63.00	56.65	57.43	52.82
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	52.87	4.58	3.07	7.58	3.94	0.34	117.36	129.40	6.47	15.10	4.35
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.96	0.79	0.52	0.55	0.78	0.11	1.20	1.23	0.72	0.78	0.42
d, Delay for Lane Group [s/veh]	116.17	34.59	28.76	57.97	18.74	11.26	180.36	192.40	63.12	72.53	57.17
Lane Group LOS	F	C	C	E	B	B	F	F	E	E	E
Critical Lane Group	Yes	No	No	No	Yes	No	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	10.01	15.81	7.41	5.37	9.07	0.78	20.70	20.74	9.14	11.68	4.38
50th-Percentile Queue Length [ft/ln]	250.20	395.20	185.37	134.19	226.86	19.57	517.41	518.57	228.58	291.94	109.38
95th-Percentile Queue Length [veh/ln]	15.20	22.33	11.88	9.17	14.01	1.41	30.65	31.00	14.10	17.28	7.81
95th-Percentile Queue Length [ft/ln]	379.91	558.22	297.01	229.18	350.37	35.22	766.34	775.02	352.55	432.04	195.14

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	116.17	34.59	28.76	57.97	18.74	11.26	180.36	187.35	192.40	63.12	72.53	57.17
Movement LOS	F	C	C	E	B	B	F	F	F	E	E	E
d_A, Approach Delay [s/veh]	43.01			22.55			186.32			65.31		
Approach LOS	D			C			F			E		
d_I, Intersection Delay [s/veh]	61.90											
Intersection LOS	E											
Intersection V/C	0.826											

Emissions

Vehicle Miles Traveled [mph]	4.58	26.67	7.73	3.75	29.49	1.80	8.28	8.12	11.35	6.66	2.87
Stops [stops/h]	240.19	758.79	177.95	128.82	435.57	18.78	496.71	497.82	438.87	280.26	105.01
Fuel consumption [US gal/h]	6.54	14.64	3.54	2.98	9.14	0.38	15.93	16.51	9.04	5.97	2.11
CO [g/h]	457.33	1023.47	247.50	207.98	639.11	26.85	1113.45	1154.09	632.15	417.27	147.19
NOx [g/h]	88.98	199.13	48.16	40.47	124.35	5.22	216.64	224.54	122.99	81.18	28.64
VOC [g/h]	105.99	237.20	57.36	48.20	148.12	6.22	258.05	267.47	146.51	96.71	34.11

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.027	2.367	2.768
Crosswalk LOS	F	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.53	25.34	54.89	52.37
l_b,int, Bicycle LOS Score for Intersection	2.916	2.779	2.131	3.013
Bicycle LOS	C	C	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	37.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.874

Intersection Setup

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration	┐|		┣		┳┓	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Base Volume Input [veh/h]	391	517	410	147	151	488
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	391	517	410	147	151	488
Peak Hour Factor	0.8988	0.8988	0.8988	0.8988	0.8988	0.8988
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	109	144	114	41	42	136
Total Analysis Volume [veh/h]	435	575	456	164	168	543
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	11		0		10	
v_di, Inbound Pedestrian Volume crossing m	10		0		11	
v_co, Outbound Pedestrian Volume crossing	0		1		1	
v_ci, Inbound Pedestrian Volume crossing mi	0		1		1	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	39		37		22	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	44	35	70	0	33	44
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	18	18	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	48	93	45	0	37	48
Lead / Lag	Lead	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	3.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	No	Yes		Yes	No
Pedestrian Recall	No	Yes	Yes		No	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	2.60	0.00	0.00
g_i, Effective Green Time [s]	38	91	49	35	75
g / C, Green / Cycle	0.29	0.70	0.38	0.27	0.57
(v / s)_i Volume / Saturation Flow Rate	0.24	0.31	0.35	0.09	0.34
s, saturation flow rate [veh/h]	1781	1870	1754	1781	1574
c, Capacity [veh/h]	515	1310	658	479	872
d1, Uniform Delay [s]	43.43	8.40	39.24	38.33	19.57
k, delay calibration	0.29	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.59	1.07	23.42	2.01	3.33
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.84	0.44	0.94	0.35	0.62
d, Delay for Lane Group [s/veh]	53.03	9.47	62.66	40.34	22.91
Lane Group LOS	D	A	E	D	C
Critical Lane Group	Yes	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	14.36	6.78	22.92	4.63	11.70
50th-Percentile Queue Length [ft/ln]	359.05	169.46	573.00	115.70	292.56
95th-Percentile Queue Length [veh/ln]	20.58	11.05	30.77	8.16	17.31
95th-Percentile Queue Length [ft/ln]	514.43	276.20	769.28	203.90	432.82

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	53.03	9.47	62.66	62.66	40.34	22.91
Movement LOS	D	A	E	E	D	C
d_A, Approach Delay [s/veh]	28.23		62.66		27.03	
Approach LOS	C		E		C	
d_I, Intersection Delay [s/veh]	36.98					
Intersection LOS	D					
Intersection V/C	0.874					

Emissions

Vehicle Miles Traveled [mph]	39.09	51.67	14.70	3.97	12.85
Stops [stops/h]	397.72	187.71	634.70	128.16	324.07
Fuel consumption [US gal/h]	9.17	4.49	13.24	2.25	4.85
CO [g/h]	641.32	313.84	925.38	157.32	339.06
NOx [g/h]	124.78	61.06	180.05	30.61	65.97
VOC [g/h]	148.63	72.74	214.47	36.46	78.58

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.31	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.721	0.000	2.384
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1362	623	500
d_b, Bicycle Delay [s]	6.76	31.39	36.97
l_b,int, Bicycle LOS Score for Intersection	3.226	2.583	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	53.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.626

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Base Volume Input [veh/h]	113	611	230	281	577	44	10	18	2	146	75	328
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	113	611	230	281	577	44	10	18	2	146	75	328
Peak Hour Factor	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	31	170	64	78	161	12	3	5	1	41	21	91
Total Analysis Volume [veh/h]	126	680	256	313	642	49	11	20	2	163	83	365
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	40			8			9			41		
v_di, Inbound Pedestrian Volume crossing m	41			9			8			40		
v_co, Outbound Pedestrian Volume crossing	2			6			1			5		
v_ci, Inbound Pedestrian Volume crossing mi	1			5			2			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	15			38			8			23		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	28	62	25	22	57	0	62	25	62	57	25	57
Amber [s]	3.5	3.5	3.5	3.0	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.6	0.0	0.0	0.0	0.0	2.6	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	9	55	38	37	83	0	55	38	55	83	38	83
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	3.0	3.6	2.9	3.0	3.6	0.0	3.6	2.9	3.6	3.6	2.9	3.6
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	131	131	131	131	131	131	131	131	131	131
L, Total Lost Time per Cycle [s]	4.50	4.60	4.60	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.50	2.60	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	5	61	61	27	82	82	35	35	35	35
g / C, Green / Cycle	0.04	0.46	0.46	0.20	0.63	0.63	0.27	0.27	0.27	0.27
(v / s)_i Volume / Saturation Flow Rate	0.07	0.19	0.18	0.18	0.19	0.19	0.01	0.01	0.17	0.24
s, saturation flow rate [veh/h]	1781	3560	1404	1781	1870	1806	938	1836	1409	1521
c, Capacity [veh/h]	68	1650	651	365	1181	1141	139	488	420	404
d1, Uniform Delay [s]	62.76	23.22	22.39	50.05	10.89	10.91	54.76	35.61	44.13	45.67
k, delay calibration	0.11	0.50	0.50	0.26	0.50	0.50	0.10	0.10	0.14	0.30
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	395.60	0.76	1.78	12.92	0.64	0.67	0.23	0.04	1.62	17.53
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.85	0.41	0.39	0.86	0.30	0.30	0.08	0.05	0.59	0.90
d, Delay for Lane Group [s/veh]	458.36	23.98	24.17	62.97	11.53	11.59	54.98	35.65	45.75	63.20
Lane Group LOS	F	C	C	E	B	B	D	D	D	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	9.72	7.04	5.30	11.08	4.62	4.52	0.35	0.54	7.36	13.21
50th-Percentile Queue Length [ft/ln]	243.01	175.89	132.59	276.98	115.44	113.03	8.73	13.59	184.01	330.32
95th-Percentile Queue Length [veh/ln]	16.66	11.39	9.08	16.54	8.14	8.01	0.63	0.98	11.81	19.17
95th-Percentile Queue Length [ft/ln]	416.60	284.64	227.01	413.45	203.55	200.21	15.71	24.45	295.24	479.36

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	458.36	23.98	24.17	62.97	11.56	11.59	54.98	35.65	35.65	45.75	45.75	63.20
Movement LOS	F	C	C	E	B	B	D	D	D	D	D	E
d_A, Approach Delay [s/veh]	75.56			27.59			42.09			56.18		
Approach LOS	E			C			D			E		
d_I, Intersection Delay [s/veh]	53.01											
Intersection LOS	D											
Intersection V/C	0.626											

Emissions

Vehicle Miles Traveled [mph]	2.99	16.12	6.07	28.13	31.44	30.66	0.81	1.61	5.82	8.64
Stops [stops/h]	268.15	388.17	146.31	305.63	127.39	124.73	9.63	14.99	203.04	364.49
Fuel consumption [US gal/h]	13.88	6.85	2.59	7.38	2.98	2.91	0.19	0.28	3.65	7.06
CO [g/h]	970.26	478.98	181.11	515.95	208.10	203.49	13.04	19.30	255.24	493.72
NOx [g/h]	188.78	93.19	35.24	100.38	40.49	39.59	2.54	3.76	49.66	96.06
VOC [g/h]	224.87	111.01	41.97	119.58	48.23	47.16	3.02	4.47	59.15	114.42

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.71	54.71	54.71	54.71
l_p,int, Pedestrian LOS Score for Intersectio	3.057	2.802	2.021	2.348
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	774	1203	513	513
d_b, Bicycle Delay [s]	24.71	10.56	36.19	36.47
l_b,int, Bicycle LOS Score for Intersection	2.436	2.388	1.614	2.568
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	59.0
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.736

Intersection Setup

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Base Volume Input [veh/h]	163	362	245	276	313	24	35	284	127	381	228	436
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	163	362	245	276	313	24	35	284	127	381	228	436
Peak Hour Factor	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	43	95	64	72	82	6	9	74	33	100	60	114
Total Analysis Volume [veh/h]	170	379	256	289	327	25	37	297	133	398	238	456
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			2			10			2		
v_di, Inbound Pedestrian Volume crossing m	10			2			10			2		
v_co, Outbound Pedestrian Volume crossing	2			5			5			3		
v_ci, Inbound Pedestrian Volume crossing mi	3			5			5			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	6			7			17			17		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	0	0	0	0	0	0	0	0	0	0	0
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	32	0	39	39	39	0	33	0	46	46	46
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	3	0	3	3	3	0	3	0	3	3	3
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	22	22	22	22	22	22	22	27	27	27	61	61	61
g / C, Green / Cycle	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.18	0.18	0.18	0.41	0.41	0.41
(v / s)_i Volume / Saturation Flow Rate	0.10	0.12	0.12	0.13	0.12	0.12	0.12	0.02	0.16	0.09	0.18	0.17	0.29
s, saturation flow rate [veh/h]	1781	1870	1758	1533	1781	1836	1814	1781	1870	1486	1781	1847	1556
c, Capacity [veh/h]	258	271	255	222	262	270	267	316	332	264	726	753	634
d1, Uniform Delay [s]	60.61	62.37	62.48	62.41	61.84	61.81	61.89	51.83	60.33	55.38	32.03	31.79	36.90
k, delay calibration	0.11	0.19	0.20	0.21	0.11	0.11	0.11	0.11	0.32	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.84	11.07	12.83	17.37	5.62	5.37	5.69	0.16	20.57	1.49	1.92	1.74	6.89
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.66	0.83	0.85	0.87	0.80	0.80	0.81	0.12	0.90	0.50	0.44	0.42	0.72
d, Delay for Lane Group [s/veh]	63.45	73.44	75.31	79.77	67.45	67.18	67.59	51.99	80.90	56.88	33.95	33.52	43.79
Lane Group LOS	E	E	E	E	E	E	E	D	F	E	C	C	D
Critical Lane Group	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.36	9.26	8.95	8.27	8.18	8.39	8.40	1.20	12.98	4.67	8.90	8.81	15.28
50th-Percentile Queue Length [ft/ln]	158.9	231.5	223.8	206.8	204.57	209.69	210.07	30.01	324.50	116.65	222.57	220.35	382.00
95th-Percentile Queue Length [veh/ln]	10.49	14.26	13.86	12.99	12.87	13.14	13.16	2.16	18.89	8.21	13.80	13.68	21.69
95th-Percentile Queue Length [ft/ln]	262.3	356.3	346.4	324.8	321.86	328.44	328.92	54.02	472.21	205.21	344.90	342.07	542.27

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	63.45	74.19	78.93	67.38	67.42	67.59	51.99	80.90	56.88	33.86	33.52	43.79
Movement LOS	E	E	E	E	E	E	D	F	E	C	C	D
d_A, Approach Delay [s/veh]	73.35			67.40			71.77			37.93		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	58.97											
Intersection LOS	E											
Intersection V/C	0.736											

Emissions

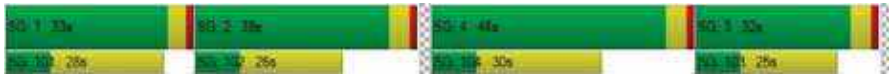
Vehicle Miles Traveled [mph]	4.03	5.36	5.11	4.58	4.98	5.11	5.11	0.88	7.03	3.15	135.18	135.18	193.84
Stops [stops/h]	152.6	222.3	214.8	198.5	196.39	201.31	201.67	28.81	311.52	111.98	213.67	211.53	366.72
Fuel consumption [US gal/h]	3.20	4.83	4.70	4.42	4.17	4.27	4.29	0.59	6.90	2.29	9.10	9.06	14.19
CO [g/h]	223.9	337.6	328.5	309.0	291.58	298.58	299.55	41.01	482.29	159.90	635.76	633.26	991.62
NOx [g/h]	43.57	65.69	63.92	60.13	56.73	58.09	58.28	7.98	93.84	31.11	123.70	123.21	192.93
VOC [g/h]	51.90	78.25	76.14	71.63	67.58	69.20	69.42	9.50	111.78	37.06	147.34	146.76	229.82

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.48	63.48	63.48	63.48
l_p,int, Pedestrian LOS Score for Intersectio	4.332	2.619	2.374	2.800
Crosswalk LOS	E	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	457	383	551
d_b, Bicycle Delay [s]	50.34	44.78	49.47	39.72
l_b,int, Bicycle LOS Score for Intersection	3.049	2.088	2.330	3.361
Bicycle LOS	C	B	B	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



A270

Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	17.2
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.698

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	147	112	114	49	98	12	4	676	158	35	907	10
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	147	112	114	49	98	12	4	676	158	35	907	10
Peak Hour Factor	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	38	29	29	13	25	3	1	174	41	9	233	3
Total Analysis Volume [veh/h]	151	115	117	50	101	12	4	696	163	36	934	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	3			6			6			4		
v_di, Inbound Pedestrian Volume crossing m	4			6			6			3		
v_co, Outbound Pedestrian Volume crossing	1			3			0			2		
v_ci, Inbound Pedestrian Volume crossing mi	0			2			1			3		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	13			7			28			32		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	26	0	26	26	26	64	64	64	64	64	64
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	19	19	19	19	62	62	62	62
g / C, Green / Cycle	0.21	0.21	0.21	0.21	0.69	0.69	0.69	0.69
(v / s)_i Volume / Saturation Flow Rate	0.12	0.14	0.04	0.06	0.01	0.48	0.06	0.51
s, saturation flow rate [veh/h]	1254	1684	1143	1822	594	1795	643	1866
c, Capacity [veh/h]	265	362	171	391	282	1246	325	1295
d1, Uniform Delay [s]	37.15	32.18	39.85	29.58	19.69	8.07	18.25	8.52
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.91	1.90	0.93	0.40	0.09	3.14	0.69	3.63
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.57	0.64	0.29	0.29	0.01	0.69	0.11	0.73
d, Delay for Lane Group [s/veh]	39.06	34.08	40.78	29.99	19.78	11.21	18.94	12.15
Lane Group LOS	D	C	D	C	B	B	B	B
Critical Lane Group	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.34	4.76	1.11	2.09	0.06	9.31	0.55	10.84
50th-Percentile Queue Length [ft/ln]	83.53	118.93	27.71	52.21	1.57	232.67	13.77	271.10
95th-Percentile Queue Length [veh/ln]	6.01	8.33	1.99	3.76	0.11	14.31	0.99	16.24
95th-Percentile Queue Length [ft/ln]	150.36	208.36	49.87	93.97	2.83	357.75	24.79	406.11

A272

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	39.06	34.08	34.08	40.78	29.99	29.99	19.78	11.21	11.21	18.94	12.15	12.15
Movement LOS	D	C	C	D	C	C	B	B	B	B	B	B
d_A, Approach Delay [s/veh]	36.04			33.30			11.25			12.40		
Approach LOS	D			C			B			B		
d_I, Intersection Delay [s/veh]	17.20											
Intersection LOS	B											
Intersection V/C	0.698											

Emissions

Vehicle Miles Traveled [mph]	10.81	16.61	4.33	9.79	1.70	365.15	3.58	93.84
Stops [stops/h]	133.65	190.29	44.33	83.53	2.51	372.28	22.03	433.76
Fuel consumption [US gal/h]	2.20	3.09	0.78	1.45	0.10	19.81	0.38	8.22
CO [g/h]	153.72	215.72	54.50	101.35	7.14	1384.60	26.86	574.49
NOx [g/h]	29.91	41.97	10.60	19.72	1.39	269.39	5.23	111.78
VOC [g/h]	35.63	50.00	12.63	23.49	1.66	320.89	6.22	133.14

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
l_p,int, Pedestrian LOS Score for Intersectio	2.176	2.024	2.685	2.576
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	487	487	1331	1331
d_b, Bicycle Delay [s]	25.93	25.85	5.10	5.12
l_b,int, Bicycle LOS Score for Intersection	2.192	1.829	2.984	3.177
Bicycle LOS	B	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	25.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.888

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	4	7	4	252	4	46	34	769	5	5	911	184
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	7	4	252	4	46	34	769	5	5	911	184
Peak Hour Factor	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	2	1	64	1	12	9	194	1	1	230	46
Total Analysis Volume [veh/h]	4	7	4	255	4	46	34	777	5	5	921	186
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	20			8			8			20		
v_di, Inbound Pedestrian Volume crossing m	20			8			8			20		
v_co, Outbound Pedestrian Volume crossing	5			2			4			2		
v_ci, Inbound Pedestrian Volume crossing mi	4			2			5			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	7			13			9			59		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	30.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	36	0	36	36	36	94	94	94	94	94	94
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	31	31	91	91	91	91
g / C, Green / Cycle	0.24	0.24	0.70	0.70	0.70	0.70
(v / s)_i Volume / Saturation Flow Rate	0.01	0.22	0.07	0.42	0.01	0.62
s, saturation flow rate [veh/h]	1758	1359	509	1867	691	1796
c, Capacity [veh/h]	452	373	165	1307	379	1257
d1, Uniform Delay [s]	38.17	48.43	42.79	10.07	18.48	15.25
k, delay calibration	0.11	0.39	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.03	14.33	2.79	2.03	0.06	9.03
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.03	0.82	0.21	0.60	0.01	0.88
d, Delay for Lane Group [s/veh]	38.20	62.76	45.58	12.10	18.54	24.28
Lane Group LOS	D	E	D	B	B	C
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.38	11.17	1.06	11.73	0.09	26.07
50th-Percentile Queue Length [ft/ln]	9.51	279.36	26.56	293.26	2.22	651.77
95th-Percentile Queue Length [veh/ln]	0.68	16.66	1.91	17.35	0.16	34.44
95th-Percentile Queue Length [ft/ln]	17.12	416.42	47.81	433.68	3.99	861.11

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	38.20	38.20	38.20	62.76	62.76	62.76	45.58	12.10	12.10	18.54	24.28	24.28
Movement LOS	D	D	D	E	E	E	D	B	B	B	C	C
d_A, Approach Delay [s/veh]	38.20			62.76			13.50			24.26		
Approach LOS	D			E			B			C		
d_I, Intersection Delay [s/veh]	25.67											
Intersection LOS	C											
Intersection V/C	0.888											

Emissions

Vehicle Miles Traveled [mph]	0.42	7.24	3.38	77.73	0.12	26.18
Stops [stops/h]	10.54	309.45	29.42	324.84	2.46	721.96
Fuel consumption [US gal/h]	0.18	5.90	0.58	6.67	0.04	10.54
CO [g/h]	12.31	412.59	40.55	466.06	2.61	736.52
NOx [g/h]	2.40	80.28	7.89	90.68	0.51	143.30
VOC [g/h]	2.85	95.62	9.40	108.01	0.60	170.70

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	1.751	2.040	2.447	3.019
Crosswalk LOS	A	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	491	491	1383	1383
d_b, Bicycle Delay [s]	37.14	37.26	6.21	6.37
l_b,int, Bicycle LOS Score for Intersection	1.584	2.063	2.906	3.394
Bicycle LOS	A	B	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	114.1
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.124

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	73	6	344	67	10	24	19	1123	7	36	1006	56
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	73	6	344	67	10	24	19	1123	7	36	1006	56
Peak Hour Factor	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	2	89	17	3	6	5	289	2	9	259	14
Total Analysis Volume [veh/h]	75	6	354	69	10	25	20	1157	7	37	1036	58
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	9			3			8			3		
v_di, Inbound Pedestrian Volume crossing m	8			3			9			3		
v_co, Outbound Pedestrian Volume crossing	4			11			11			4		
v_ci, Inbound Pedestrian Volume crossing mi	4			11			11			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			3			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	165	165	165	165	165	165	165	165	165	165
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	30	30	13	13	13	3	96	96	7	100
g / C, Green / Cycle	0.18	0.18	0.08	0.08	0.08	0.02	0.58	0.58	0.04	0.61
(v / s)_i Volume / Saturation Flow Rate	0.08	0.30	0.03	0.03	0.02	0.02	0.35	0.35	0.04	0.72
s, saturation flow rate [veh/h]	937	1181	937	1368	1342	937	1422	1866	937	1528
c, Capacity [veh/h]	170	215	77	112	110	20	831	1090	40	927
d1, Uniform Delay [s]	60.00	67.47	72.01	72.00	70.65	80.74	22.07	22.08	78.62	32.47
k, delay calibration	0.11	0.50	0.11	0.11	0.11	0.11	0.27	0.27	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.78	323.89	3.64	2.48	1.04	99.66	1.77	1.36	46.99	92.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.44	1.68	0.42	0.42	0.23	1.02	0.61	0.61	0.92	1.18
d, Delay for Lane Group [s/veh]	61.77	391.35	75.65	74.47	71.69	180.40	23.84	23.43	125.61	124.94
Lane Group LOS	E	F	E	E	E	F	C	C	F	F
Critical Lane Group	No	Yes	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.92	28.45	1.41	2.02	1.05	1.39	13.15	17.14	2.11	59.90
50th-Percentile Queue Length [ft/ln]	73.00	711.28	35.37	50.42	26.23	34.73	328.81	428.55	52.81	1497.55
95th-Percentile Queue Length [veh/ln]	5.26	45.32	2.55	3.63	1.89	2.50	19.10	23.93	3.80	83.00
95th-Percentile Queue Length [ft/ln]	131.40	1133.08	63.66	90.75	47.22	62.51	477.50	598.31	95.07	2075.12

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	61.77	391.35	391.35	75.04	74.47	71.69	180.40	23.61	23.43	125.61	124.94	124.94
Movement LOS	E	F	F	E	E	E	F	C	C	F	F	F
d_A, Approach Delay [s/veh]	334.53			74.17			26.26			124.97		
Approach LOS	F			E			C			F		
d_I, Intersection Delay [s/veh]	114.11											
Intersection LOS	F											
Intersection V/C	1.124											

Emissions

Vehicle Miles Traveled [mph]	3.58	17.17	1.24	1.79	0.96	0.47	11.90	15.62	4.76	140.79
Stops [stops/h]	63.79	621.55	30.91	44.06	22.92	30.35	287.33	374.49	46.15	1308.62
Fuel consumption [US gal/h]	1.35	31.82	0.59	0.84	0.44	0.87	4.08	5.29	1.34	39.16
CO [g/h]	94.25	2224.24	41.27	59.06	30.56	60.93	285.15	369.72	93.44	2737.44
NOx [g/h]	18.34	432.76	8.03	11.49	5.95	11.86	55.48	71.93	18.18	532.61
VOC [g/h]	21.84	515.49	9.56	13.69	7.08	14.12	66.09	85.69	21.66	634.43

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	71.76	71.76	71.76	71.76
l_p,int, Pedestrian LOS Score for Intersectio	2.101	2.175	2.631	2.849
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	364	243	243
d_b, Bicycle Delay [s]	55.15	55.15	63.70	63.74
l_b,int, Bicycle LOS Score for Intersection	2.277	1.731	2.536	3.426
Bicycle LOS	B	A	B	C

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	133.5
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.254

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	393	58	105	1406	1228	660
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	393	58	105	1406	1228	660
Peak Hour Factor	0.9360	0.9360	0.9360	0.9360	0.9360	0.9360
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	15	28	376	328	176
Total Analysis Volume [veh/h]	420	62	112	1502	1312	705
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	4		0		4	
v_ci, Inbound Pedestrian Volume crossing mi	4		0		4	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	1		11		2	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	18	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	20	12	60	48	48
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	95	95	95	95	95	95
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	36	36	9	49	36	36
g / C, Green / Cycle	0.38	0.38	0.10	0.52	0.38	0.38
(v / s)_i Volume / Saturation Flow Rate	0.45	0.04	0.09	0.57	0.47	0.57
s, saturation flow rate [veh/h]	937	1569	1312	2623	2792	1227
c, Capacity [veh/h]	356	596	130	1358	1064	468
d1, Uniform Delay [s]	29.30	18.91	41.88	22.79	29.23	28.84
k, delay calibration	0.50	0.04	0.04	0.28	0.20	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	106.24	0.03	6.13	54.60	108.25	239.18
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.18	0.10	0.86	1.11	1.23	1.51
d, Delay for Lane Group [s/veh]	135.53	18.94	48.01	77.38	137.48	268.02
Lane Group LOS	F	B	D	F	F	F
Critical Lane Group	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	18.19	0.87	2.76	24.08	27.31	40.89
50th-Percentile Queue Length [ft/ln]	454.87	21.73	69.12	601.91	682.71	1022.15
95th-Percentile Queue Length [veh/ln]	27.89	1.56	4.98	34.63	40.88	64.18
95th-Percentile Queue Length [ft/ln]	697.25	39.11	124.42	865.70	1021.88	1604.39

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	135.53	18.94	48.01	77.38	137.48	268.02
Movement LOS	F	B	D	F	F	F
d_A, Approach Delay [s/veh]	120.54		75.34		183.11	
Approach LOS	F		E		F	
d_I, Intersection Delay [s/veh]	133.49					
Intersection LOS	F					
Intersection V/C	1.254					

Emissions

Vehicle Miles Traveled [mph]	9.95	1.47	14.41	193.30	31.08	16.70
Stops [stops/h]	692.69	33.09	105.26	1833.24	2079.32	1556.59
Fuel consumption [US gal/h]	15.82	0.48	2.27	41.74	53.52	50.79
CO [g/h]	1105.73	33.70	158.61	2917.31	3741.31	3550.11
NOx [g/h]	215.13	6.56	30.86	567.60	727.92	690.72
VOC [g/h]	256.26	7.81	36.76	676.11	867.08	822.77

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.92	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.364	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	334	1153	899
d_b, Bicycle Delay [s]	32.82	8.53	14.34
l_b,int, Bicycle LOS Score for Intersection	1.560	2.891	3.224
Bicycle LOS	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	138.5
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	2.031

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

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Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	922	0	283	0	1091	593	0	1646	1219	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	922	0	283	0	1091	593	0	1646	1219	0	0	0
Peak Hour Factor	0.9611	1.0000	0.9611	1.0000	0.9611	0.9611	1.0000	0.9611	0.9611	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	240	0	74	0	284	154	0	428	317	0	0	0
Total Analysis Volume [veh/h]	959	0	294	0	1135	617	0	1713	1268	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			9			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	23	0	0	0	57	0	0	57	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	4	0	0	4	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				No			No				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	80	80	80	80	80	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
I2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	19	19	53	53	53	
g / C, Green / Cycle	0.24	0.24	0.66	0.66	0.66	
(v / s)_i Volume / Saturation Flow Rate	0.28	0.10	0.22	0.34	1.35	
s, saturation flow rate [veh/h]	3459	2813	5094	5094	941	
c, Capacity [veh/h]	821	668	3375	3375	624	
d1, Uniform Delay [s]	30.50	25.97	5.86	6.86	13.50	
k, delay calibration	0.11	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	78.54	0.46	0.27	0.55	470.76	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	1.17	0.44	0.34	0.51	2.03	
d, Delay for Lane Group [s/veh]	109.04	26.43	6.13	7.41	484.26	
Lane Group LOS	F	C	A	A	F	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	16.53	2.35	2.33	4.14	90.06	
50th-Percentile Queue Length [ft/ln]	413.35	58.76	58.28	103.56	2251.53	
95th-Percentile Queue Length [veh/ln]	25.18	4.23	4.20	7.46	152.02	
95th-Percentile Queue Length [ft/ln]	629.53	105.77	104.91	186.41	3800.55	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	109.04	0.00	26.43	0.00	6.13	0.00	0.00	7.41	484.26	0.00	0.00	0.00
Movement LOS	F		C		A			A	F			
d_A, Approach Delay [s/veh]	89.66			4.03			210.24			0.00		
Approach LOS	F			A			F			A		
d_I, Intersection Delay [s/veh]	138.51											
Intersection LOS	F											
Intersection V/C	2.031											

Emissions

Vehicle Miles Traveled [mph]	22.74	6.97	26.83	169.81	125.69	
Stops [stops/h]	1488.05	211.54	314.73	559.23	4052.75	
Fuel consumption [US gal/h]	30.43	3.04	4.26	12.66	152.50	
CO [g/h]	2127.40	212.27	297.79	885.26	10659.43	
NOx [g/h]	413.92	41.30	57.94	172.24	2073.94	
VOC [g/h]	493.05	49.20	69.02	205.17	2470.43	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	31.51	0.00	31.51
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.027	0.000	1.419
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	475	1325	1325	0
d_b, Bicycle Delay [s]	23.26	4.58	4.56	40.00
l_b,int, Bicycle LOS Score for Intersection	1.560	2.184	3.199	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	88.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.208

Intersection Setup

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	512	0	1185	0	0	0	0	1429	486	0	2353	534
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	512	0	1185	0	0	0	0	1429	486	0	2353	534
Peak Hour Factor	0.9889	1.0000	0.9889	0.9889	0.9889	0.9889	1.0000	0.9889	0.9889	1.0000	0.9889	0.9889
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	129	0	300	0	0	0	0	361	123	0	595	135
Total Analysis Volume [veh/h]	518	0	1198	0	0	0	0	1445	491	0	2379	540
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			7		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	7	0	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	30	0	0	50	0	0	58	0
Amber [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	5	0	5	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	10	0	10	0	10	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No			No	
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	0	10	0	20	0	0	50	0	0	50	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	5	0	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No		No			No			No	
Maximum Recall	No		No		No			No			No	
Pedestrian Recall	No		No		No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	C	R
C, Calculated Cycle Length [s]	80	80	80	80	80	80
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	16	26	16	46	56	46
g / C, Green / Cycle	0.20	0.33	0.20	0.58	0.70	0.58
(v / s)_i Volume / Saturation Flow Rate	0.19	0.43	0.00	0.28	0.84	0.63
s, saturation flow rate [veh/h]	2752	2813	1870	5094	2828	861
c, Capacity [veh/h]	572	914	419	2929	1980	495
d1, Uniform Delay [s]	31.62	27.00	0.00	10.09	12.00	16.45
k, delay calibration	0.11	0.13	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	5.78	141.78	0.00	0.60	95.84	67.36
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.91	1.31	0.00	0.49	1.20	1.09
d, Delay for Lane Group [s/veh]	37.41	168.78	0.00	10.68	107.84	83.81
Lane Group LOS	D	F	A	B	F	F
Critical Lane Group	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	5.22	26.21	0.00	4.57	25.89	16.66
50th-Percentile Queue Length [ft/ln]	130.48	655.28	0.00	114.33	647.27	416.48
95th-Percentile Queue Length [veh/ln]	8.97	40.26	0.00	8.08	39.40	24.91
95th-Percentile Queue Length [ft/ln]	224.15	1006.44	0.00	202.00	984.88	622.75

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	37.41	0.00	168.78	0.00	0.00	0.00	0.00	10.68	0.00	0.00	107.84	83.81
Movement LOS	D		F	A	A	A		B			F	F
d_A, Approach Delay [s/veh]	129.12			0.00			7.99			103.40		
Approach LOS	F			A			A			F		
d_I, Intersection Delay [s/veh]	87.98											
Intersection LOS	F											
Intersection V/C	1.208											

Emissions

Vehicle Miles Traveled [mph]	12.87	29.76	0.00	143.24	108.16	24.55
Stops [stops/h]	469.74	2359.02	0.00	617.37	3495.27	749.66
Fuel consumption [US gal/h]	7.07	55.40	0.00	12.45	75.96	14.36
CO [g/h]	494.05	3872.43	0.00	870.21	5309.92	1003.88
NOx [g/h]	96.12	753.43	0.00	169.31	1033.12	195.32
VOC [g/h]	114.50	897.47	0.00	201.68	1230.63	232.66

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0		9.0	0.0	0.0	
M_corner, Corner Circulation Area [ft²/ped]	0.00		0.00	0.00	0.00	
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00		0.00	0.00	0.00	
d_p, Pedestrian Delay [s]	31.51		31.51	0.00	0.00	
I_p,int, Pedestrian LOS Score for Intersectio	2.630		1.974	0.000	0.000	
Crosswalk LOS	B		A	F	F	
s_b, Saturation Flow Rate of the bicycle lane	2000		2000	2000	2000	
c_b, Capacity of the bicycle lane [bicycles/h]	400		400	1150	1400	
d_b, Bicycle Delay [s]	25.60		25.60	7.23	3.61	
I_b,int, Bicycle LOS Score for Intersection	1.560		1.560	2.354	3.165	
Bicycle LOS	A		A	B	C	

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.PM.vistro
Report File: C:\...\C PM.pdf

Scenario 19 Cumulative PM
2/10/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road/101 NB Ramps	Signalized	HCM 7th Edition	WB Right	0.923	23.4	C
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	SB Thru	0.922	26.2	C
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	NB Left	0.840	30.9	C
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	NB Left	0.886	47.3	D
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	SB Left	0.795	50.2	D
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	EB Thru	0.781	67.7	E
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	NB Left	0.814	47.0	D
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	NB Left	0.698	31.5	C
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	EB Left	0.709	39.5	D
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	EB Thru	0.796	61.1	E
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	WB Left	0.835	29.8	C
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.930	28.8	C
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	EB Left	0.766	23.5	C
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	EB Left	0.906	20.4	C
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	1.376	73.9	E
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	1.193	185.1	F

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road/101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	23.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.923

Intersection Setup

Name	Marsh Road		Marsh Road		101 NB Ramps	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

Volumes

Name	Marsh Road		Marsh Road		101 NB Ramps	
Base Volume Input [veh/h]	2152	0	0	1540	605	591
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2152	0	0	1540	605	591
Peak Hour Factor	0.9490	1.0000	1.0000	0.9490	0.9490	0.9490
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	567	0	0	406	159	156
Total Analysis Volume [veh/h]	2268	0	0	1623	638	623
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		1	
v_ci, Inbound Pedestrian Volume crossing mi	1		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		7		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	100	0	0	100	100	5
Amber [s]	4.1	0.0	0.0	4.1	3.2	3.0
All red [s]	0.5	0.0	0.0	0.5	1.0	1.0
Walk [s]	7	0	0	10	5	5
Pedestrian Clearance [s]	12	0	0	10	15	10
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	2.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	70	0	0	70	30	9
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	5
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	3.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	Yes	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	68	68	28	28
g / C, Green / Cycle	0.68	0.68	0.28	0.28
(v / s)_i Volume / Saturation Flow Rate	0.64	0.46	0.18	0.22
s, saturation flow rate [veh/h]	3560	3560	3459	2813
c, Capacity [veh/h]	2403	2403	968	788
d1, Uniform Delay [s]	14.55	9.71	31.78	33.29
k, delay calibration	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.21	1.54	3.51	7.97
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.94	0.68	0.66	0.79
d, Delay for Lane Group [s/veh]	23.76	11.25	35.29	41.26
Lane Group LOS	C	B	D	D
Critical Lane Group	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	22.27	9.68	7.17	7.72
50th-Percentile Queue Length [ft/ln]	556.65	241.91	179.17	192.99
95th-Percentile Queue Length [veh/ln]	30.00	14.78	11.56	12.28
95th-Percentile Queue Length [ft/ln]	750.11	369.45	288.93	306.91

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	23.76	0.00	0.00	11.25	35.29	41.26
Movement LOS	C			B	D	D
d_A, Approach Delay [s/veh]	23.76		11.25		38.24	
Approach LOS	C		B		D	
d_I, Intersection Delay [s/veh]	23.36					
Intersection LOS	C					
Intersection V/C	0.923					

Emissions

Vehicle Miles Traveled [mph]	53.62	38.37	16.61	16.22
Stops [stops/h]	1603.15	696.71	516.02	555.81
Fuel consumption [US gal/h]	22.03	9.14	8.12	8.97
CO [g/h]	1539.87	639.15	567.36	626.94
NOx [g/h]	299.60	124.36	110.39	121.98
VOC [g/h]	356.88	148.13	131.49	145.30

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	41.41	39.61
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.238	2.443
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1308	1308	516
d_b, Bicycle Delay [s]	5.99	6.01	27.53
l_b,int, Bicycle LOS Score for Intersection	3.431	2.899	1.560
Bicycle LOS	C	C	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	26.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.922

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	1022	1321	279	1614	593
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1022	1321	279	1614	593
Peak Hour Factor	1.0000	0.9770	0.9770	1.0000	0.9770	0.9770
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	262	338	70	413	152
Total Analysis Volume [veh/h]	0	1046	1352	279	1652	607
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		4		5	
v_ci, Inbound Pedestrian Volume crossing mi	0		5		4	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	6		1		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	100	100	0	100	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	12	16	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	40	40	0	60	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	46	43	50	50
g / C, Green / Cycle	0.46	0.43	0.50	0.50
(v / s)_i Volume / Saturation Flow Rate	0.26	0.38	0.48	0.38
s, saturation flow rate [veh/h]	4000	3560	3459	1589
c, Capacity [veh/h]	1823	1548	1727	794
d1, Uniform Delay [s]	20.06	25.76	24.00	20.28
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.32	7.13	1.70	0.59
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.57	0.87	0.96	0.76
d, Delay for Lane Group [s/veh]	21.38	32.89	25.70	20.87
Lane Group LOS	C	C	C	C
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	8.84	15.25	17.85	10.96
50th-Percentile Queue Length [ft/ln]	220.88	381.28	446.19	274.01
95th-Percentile Queue Length [veh/ln]	13.71	21.66	24.78	16.39
95th-Percentile Queue Length [ft/ln]	342.74	541.40	619.41	409.75

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	21.38	32.89	0.00	25.70	20.87
Movement LOS		C	C		C	C
d_A, Approach Delay [s/veh]	21.38		32.89		24.40	
Approach LOS	C		C		C	
d_I, Intersection Delay [s/veh]	26.19					
Intersection LOS	C					
Intersection V/C	0.922					

Emissions

Vehicle Miles Traveled [mph]	24.78	32.04	39.07	14.36
Stops [stops/h]	636.12	1098.08	1285.04	394.58
Fuel consumption [US gal/h]	10.28	18.53	17.35	5.35
CO [g/h]	718.48	1295.12	1212.59	373.90
NOx [g/h]	139.79	251.98	235.93	72.75
VOC [g/h]	166.52	300.16	281.03	86.65

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	41.41	0.00	39.61
l_p,int, Pedestrian LOS Score for Intersectio	2.992	0.000	2.679
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	708	708	1118
d_b, Bicycle Delay [s]	20.93	20.88	9.72
l_b,int, Bicycle LOS Score for Intersection	2.423	2.675	1.560
Bicycle LOS	B	B	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	30.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.840

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Base Volume Input [veh/h]	57	1398	2	157	1535	295	300	6	2	15	12	291
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	57	1398	2	157	1535	295	300	6	2	15	12	291
Peak Hour Factor	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	357	1	40	392	75	77	2	1	4	3	74
Total Analysis Volume [veh/h]	58	1428	2	160	1568	301	306	6	2	15	12	297
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1			0			1			0		
v_di, Inbound Pedestrian Volume crossing m	1			0			1			0		
v_co, Outbound Pedestrian Volume crossing	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	0	1	6	0	0	4	0	0	3	0
Auxiliary Signal Groups												
Maximum Green [s]	15	40	0	10	40	0	0	20	0	0	20	0
Amber [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	7	0	0	8	0	0	8	0
Pedestrian Clearance [s]	0	21	0	0	21	0	0	24	0	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	57	0	20	62	0	0	32	0	0	36	0
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	4	10	0	0	4	0	0	6	0
Vehicle Extension [s]	2.5	3.5	0.0	2.0	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	8	89	89	11	91	91	18	18	20	20
g / C, Green / Cycle	0.06	0.61	0.61	0.07	0.63	0.63	0.12	0.12	0.14	0.14
(v / s)_i Volume / Saturation Flow Rate	0.03	0.26	0.26	0.05	0.50	0.53	0.09	0.09	0.01	0.11
s, saturation flow rate [veh/h]	1781	3560	1869	3459	1870	1756	1781	1781	1819	2813
c, Capacity [veh/h]	99	2178	1143	255	1178	1106	219	219	249	384
d1, Uniform Delay [s]	66.87	14.85	14.85	65.22	19.84	21.22	61.17	61.17	54.86	60.43
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.09	0.62	1.19	0.95	5.53	7.95	3.27	3.26	0.14	2.49
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.59	0.43	0.43	0.63	0.79	0.84	0.72	0.72	0.11	0.77
d, Delay for Lane Group [s/veh]	70.97	15.47	16.03	66.16	25.37	29.17	64.44	64.44	55.00	62.92
Lane Group LOS	E	B	B	E	C	C	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.21	8.15	8.74	2.90	23.80	25.96	5.82	5.83	0.89	5.47
50th-Percentile Queue Length [ft/ln]	55.17	203.83	218.41	72.56	594.99	649.08	145.61	145.64	22.26	136.67
95th-Percentile Queue Length [veh/ln]	3.97	12.84	13.58	5.22	31.80	34.32	9.78	9.78	1.60	9.30
95th-Percentile Queue Length [ft/ln]	99.31	320.90	339.60	130.61	795.00	857.99	244.56	244.60	40.06	232.53

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	70.97	15.66	16.03	66.16	26.90	29.17	64.44	64.44	64.44	55.00	55.00	62.92
Movement LOS	E	B	B	E	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	17.82			30.34			64.44			62.26		
Approach LOS	B			C			E			E		
d_I, Intersection Delay [s/veh]	30.92											
Intersection LOS	C											
Intersection V/C	0.840											

Emissions

Vehicle Miles Traveled [mph]	11.86	191.80	100.67	3.79	22.14	22.14	4.73	4.73	1.84	20.20
Stops [stops/h]	54.79	404.85	216.91	144.12	590.88	644.60	144.60	144.64	22.10	271.45
Fuel consumption [US gal/h]	1.70	13.31	7.07	3.38	10.11	11.24	2.83	2.83	0.47	5.75
CO [g/h]	118.95	930.22	494.47	236.43	706.80	785.58	197.52	197.57	32.82	402.06
NOx [g/h]	23.14	180.99	96.21	46.00	137.52	152.85	38.43	38.44	6.39	78.23
VOC [g/h]	27.57	215.59	114.60	54.79	163.81	182.07	45.78	45.79	7.61	93.18

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	61.00	61.00	61.92	61.92
l_p,int, Pedestrian LOS Score for Intersectio	3.058	3.276	2.148	2.403
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	717	786	383	439
d_b, Bicycle Delay [s]	29.82	26.72	47.36	44.19
l_b,int, Bicycle LOS Score for Intersection	2.378	3.234	2.078	2.094
Bicycle LOS	B	C	B	B

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	47.3
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.886

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Base Volume Input [veh/h]	271	884	93	18	1087	492	476	49	180	99	83	45
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	271	884	93	18	1087	492	476	49	180	99	83	45
Peak Hour Factor	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	70	227	24	5	279	126	122	13	46	25	21	12
Total Analysis Volume [veh/h]	279	909	96	18	1117	506	489	50	185	102	85	46
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			1			1			1		
v_di, Inbound Pedestrian Volume crossing m	1			1			2			1		
v_co, Outbound Pedestrian Volume crossing	0			3			3			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			3			3			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			3			1		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	31.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	50	50	50	0	50	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	22	45	45	22	45	45	37	36	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	140	140	140	140	140	140	140	140	140	140	140
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	20	86	86	4	70	70	26	26	26	16	16
g / C, Green / Cycle	0.14	0.61	0.61	0.03	0.50	0.50	0.19	0.19	0.19	0.11	0.11
(v / s)_i Volume / Saturation Flow Rate	0.16	0.27	0.28	0.01	0.45	0.48	0.15	0.15	0.12	0.06	0.07
s, saturation flow rate [veh/h]	1781	1870	1799	1781	1870	1648	1781	1797	1557	1781	1748
c, Capacity [veh/h]	254	1148	1105	52	935	824	336	339	293	198	195
d1, Uniform Delay [s]	60.00	14.34	14.39	66.66	31.59	33.50	54.29	54.27	52.18	58.64	59.76
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	49.17	1.25	1.32	1.47	12.69	22.25	3.32	3.26	1.66	1.53	2.99
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.10	0.44	0.45	0.35	0.89	0.96	0.80	0.80	0.63	0.51	0.67
d, Delay for Lane Group [s/veh]	109.17	15.59	15.70	68.13	44.28	55.75	57.62	57.54	53.84	60.17	62.75
Lane Group LOS	F	B	B	E	D	E	E	E	D	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	12.45	8.74	8.52	0.65	27.92	29.73	9.45	9.51	6.19	3.54	4.68
50th-Percentile Queue Length [ft/ln]	311.15	218.39	212.94	16.28	698.01	743.20	236.29	237.70	154.67	88.41	117.01
95th-Percentile Queue Length [veh/ln]	19.01	13.58	13.30	1.17	36.59	38.67	14.49	14.56	10.27	6.37	8.23
95th-Percentile Queue Length [ft/ln]	475.23	339.57	332.60	29.31	914.65	966.74	362.34	364.12	256.65	159.14	205.71

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	109.17	15.64	15.70	68.13	47.17	55.75	57.58	57.54	53.84	60.17	62.75	62.75
Movement LOS	F	B	B	E	D	E	E	E	D	E	E	E
d_A, Approach Delay [s/veh]	35.97			50.05			56.62			61.62		
Approach LOS	D			D			E			E		
d_I, Intersection Delay [s/veh]	47.31											
Intersection LOS	D											
Intersection V/C	0.886											

Emissions

Vehicle Miles Traveled [mph]	44.53	81.41	78.98	3.68	170.80	161.14	31.09	31.30	21.41	5.29	6.79
Stops [stops/h]	320.04	224.63	219.03	16.75	717.95	764.43	243.04	244.49	159.09	90.94	120.35
Fuel consumption [US gal/h]	10.30	6.41	6.24	0.52	19.43	20.83	5.48	5.51	3.60	1.84	2.44
CO [g/h]	720.08	448.13	436.13	36.06	1358.45	1455.93	382.99	385.25	251.64	128.29	170.53
NOx [g/h]	140.10	87.19	84.86	7.02	264.30	283.27	74.52	74.96	48.96	24.96	33.18
VOC [g/h]	166.89	103.86	101.08	8.36	314.83	337.43	88.76	89.28	58.32	29.73	39.52

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.43	59.43	59.43	59.43
l_p,int, Pedestrian LOS Score for Intersectio	2.984	3.116	2.476	2.069
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	577	577	457	469
d_b, Bicycle Delay [s]	35.45	35.46	41.72	41.06
l_b,int, Bicycle LOS Score for Intersection	2.619	2.913	2.754	1.944
Bicycle LOS	B	C	C	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	50.2
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.795

Intersection Setup

Name	Marsh Road			Marsh Road			Bay Road			Bay Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			No		

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Volumes

Name	Marsh Road			Marsh Road			Bay Road			Bay Road		
Base Volume Input [veh/h]	3	891	68	429	1033	71	101	34	6	63	90	216
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	891	68	429	1033	71	101	34	6	63	90	216
Peak Hour Factor	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	236	18	114	274	19	27	9	2	17	24	57
Total Analysis Volume [veh/h]	3	946	72	455	1097	75	107	36	6	67	96	229
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			6			0			6		
v_di, Inbound Pedestrian Volume crossing m	0			6			0			6		
v_co, Outbound Pedestrian Volume crossing	0			3			3			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			3			3			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			5			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	4.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	0	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	17	0	0	0	17	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	105	70	105	35	105	70	45	45	45	0	45	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
I2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	68	68	32	103	103	42	42
g / C, Green / Cycle	0.46	0.46	0.21	0.69	0.69	0.28	0.28
(v / s)_i Volume / Saturation Flow Rate	0.29	0.29	0.26	0.32	0.32	0.23	0.23
s, saturation flow rate [veh/h]	1863	1652	1781	1870	1822	661	1725
c, Capacity [veh/h]	874	754	380	1290	1257	226	510
d1, Uniform Delay [s]	31.16	31.25	59.00	10.54	10.61	52.90	50.40
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.41	0.42
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.27	4.10	111.76	1.17	1.23	11.78	8.94
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.62	0.64	1.20	0.46	0.46	0.66	0.77
d, Delay for Lane Group [s/veh]	34.43	35.35	170.76	11.71	11.84	64.69	59.34
Lane Group LOS	C	D	F	B	B	E	E
Critical Lane Group	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	15.64	14.11	26.12	8.88	8.84	6.28	15.01
50th-Percentile Queue Length [ft/ln]	391.12	352.82	653.07	222.01	221.02	157.04	375.14
95th-Percentile Queue Length [veh/ln]	22.13	20.27	37.97	13.77	13.72	10.39	21.36
95th-Percentile Queue Length [ft/ln]	553.29	506.85	949.13	344.19	342.93	259.80	533.96

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	34.43	34.82	35.35	170.76	11.77	11.84	64.69	64.69	64.69	59.34	59.34	59.34
Movement LOS	C	C	D	F	B	B	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	34.86			56.24			64.69			59.34		
Approach LOS	C			E			E			E		
d_I, Intersection Delay [s/veh]	50.17											
Intersection LOS	D											
Intersection V/C	0.795											

Emissions

Vehicle Miles Traveled [mph]	12.77	11.37	72.61	94.10	92.94	11.58	9.30
Stops [stops/h]	375.48	338.71	626.94	213.13	212.18	150.76	360.14
Fuel consumption [US gal/h]	7.10	6.44	23.29	6.59	6.54	3.06	7.11
CO [g/h]	495.96	450.06	1628.01	460.98	457.26	213.91	496.68
NOx [g/h]	96.50	87.57	316.75	89.69	88.97	41.62	96.64
VOC [g/h]	114.94	104.31	377.31	106.84	105.98	49.58	115.11

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	99.9	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	64.40	8.37	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.138	1.793	0.000
Crosswalk LOS	F	C	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	865	1332	537	537
d_b, Bicycle Delay [s]	24.15	8.37	40.21	40.13
l_b,int, Bicycle LOS Score for Intersection	2.402	2.902	1.805	2.206
Bicycle LOS	B	C	A	B

Sequence

Ring 1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	67.7
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.781

Intersection Setup

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	235	224	37	40	190	24	101	584	160	78	455	62
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	235	224	37	40	190	24	101	584	160	78	455	62
Peak Hour Factor	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	63	60	10	11	51	6	27	156	43	21	122	17
Total Analysis Volume [veh/h]	252	240	40	43	203	26	108	625	171	84	487	66
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	20			17			18			20		
v_di, Inbound Pedestrian Volume crossing m	20			18			17			20		
v_co, Outbound Pedestrian Volume crossing	34			29			33			29		
v_ci, Inbound Pedestrian Volume crossing mi	33			29			34			29		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	20			7			1			5		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	180
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	35	35	35	35	35	35	30	60	60	30	30	30
Amber [s]	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	46	40	46	40	46	13	84	84	10	81	81
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	4	4	4	4	4
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	180	180	180	180	180	180	180	180
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	0.00	2.10	0.00	2.00
g_i, Effective Green Time [s]	42	42	36	36	90	80	90	77
g / C, Green / Cycle	0.23	0.23	0.20	0.20	0.50	0.44	0.50	0.43
(v / s)_i Volume / Saturation Flow Rate	0.14	0.16	0.02	0.13	0.11	0.45	0.11	0.31
s, saturation flow rate [veh/h]	1781	1779	1781	1802	965	1757	780	1807
c, Capacity [veh/h]	415	414	355	359	331	780	161	776
d1, Uniform Delay [s]	61.71	62.87	59.11	66.08	30.55	50.05	41.88	42.18
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.50	0.19	0.27
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.49	8.57	0.70	8.37	0.57	37.54	4.54	2.98
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.68	0.12	0.64	0.33	1.02	0.52	0.71
d, Delay for Lane Group [s/veh]	68.20	71.44	59.80	74.45	31.11	87.59	46.42	45.16
Lane Group LOS	E	E	E	E	C	F	D	D
Critical Lane Group	No	Yes	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	11.16	12.77	1.72	10.64	2.62	43.08	2.17	21.05
50th-Percentile Queue Length [ft/ln]	279.03	319.36	42.88	265.98	65.43	1077.05	54.26	526.36
95th-Percentile Queue Length [veh/ln]	16.64	18.64	3.09	15.99	4.71	54.75	3.91	28.58
95th-Percentile Queue Length [ft/ln]	416.01	465.90	77.19	399.72	117.77	1368.71	97.66	714.49

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	68.20	71.44	71.44	59.80	74.45	74.45	31.11	87.59	87.59	46.42	45.16	45.16
Movement LOS	E	E	E	E	E	E	C	F	F	D	D	D
d_A, Approach Delay [s/veh]	69.91			72.13			80.85			45.33		
Approach LOS	E			E			F			D		
d_I, Intersection Delay [s/veh]	67.70											
Intersection LOS	E											
Intersection V/C	0.781											

Emissions

Vehicle Miles Traveled [mph]	5.97	6.63	1.02	5.43	2.56	18.84	1.99	13.09
Stops [stops/h]	223.23	255.49	34.31	212.79	52.34	861.64	43.41	421.09
Fuel consumption [US gal/h]	4.98	5.75	0.70	4.53	1.08	19.72	1.12	7.95
CO [g/h]	347.81	402.24	48.98	316.61	75.36	1378.60	77.94	555.48
NOx [g/h]	67.67	78.26	9.53	61.60	14.66	268.23	15.16	108.08
VOC [g/h]	80.61	93.22	11.35	73.38	17.47	319.50	18.06	128.74

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	79.34	79.34	79.34	79.34
l_p,int, Pedestrian LOS Score for Intersectio	2.349	2.226	2.515	2.410
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	460	393	881	848
d_b, Bicycle Delay [s]	53.90	58.28	28.18	29.95
l_b,int, Bicycle LOS Score for Intersection	2.437	2.008	3.051	2.611
Bicycle LOS	B	B	C	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



A301

Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	47.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.814

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	227	1389	606	198	1228	161	106	348	96	391	228	124
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	227	1389	606	198	1228	161	106	348	96	391	228	124
Peak Hour Factor	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	58	353	154	50	312	41	27	89	24	99	58	32
Total Analysis Volume [veh/h]	231	1413	616	201	1249	164	108	354	98	398	232	126
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			19			0			18		
v_di, Inbound Pedestrian Volume crossing m	0			18			0			19		
v_co, Outbound Pedestrian Volume crossing	6			15			16			6		
v_ci, Inbound Pedestrian Volume crossing mi	6			16			15			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	5			0			13			14		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.2	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.20	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	1.20	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	17	64	64	20	67	67	25	25	28	28	28
g / C, Green / Cycle	0.11	0.42	0.42	0.14	0.45	0.45	0.16	0.16	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.13	0.40	0.40	0.11	0.35	0.11	0.16	0.16	0.12	0.12	0.09
s, saturation flow rate [veh/h]	1781	3560	1553	1781	3560	1534	1835	1738	3459	1870	1455
c, Capacity [veh/h]	199	1511	659	242	1592	686	300	284	654	353	275
d1, Uniform Delay [s]	63.80	30.65	30.08	56.34	14.68	11.17	62.16	62.38	55.75	56.32	53.58
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	76.10	12.13	22.22	2.80	3.96	0.82	7.07	9.53	0.34	0.78	0.44
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.16	0.94	0.93	0.83	0.78	0.24	0.95	0.97	0.61	0.66	0.46
d, Delay for Lane Group [s/veh]	139.90	42.78	52.30	59.14	18.64	12.00	69.23	71.92	56.09	57.10	54.02
Lane Group LOS	F	D	D	E	B	B	E	E	E	E	D
Critical Lane Group	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	11.56	23.47	21.84	6.89	9.09	1.74	11.36	11.20	6.98	8.26	4.26
50th-Percentile Queue Length [ft/ln]	288.88	586.72	546.09	172.20	227.25	43.57	284.12	279.92	174.57	206.60	106.61
95th-Percentile Queue Length [veh/ln]	18.16	31.41	29.51	11.19	14.03	3.14	16.89	16.68	11.32	12.98	7.65
95th-Percentile Queue Length [ft/ln]	453.94	785.34	737.71	279.81	350.86	78.43	422.34	417.11	282.92	324.46	191.27

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	139.90	42.78	52.30	59.14	18.64	12.00	69.23	70.57	71.92	56.09	57.10	54.02
Movement LOS	F	D	D	E	B	B	E	E	E	E	E	D
d_A, Approach Delay [s/veh]	55.30			23.01			70.55			56.05		
Approach LOS	E			C			E			E		
d_I, Intersection Delay [s/veh]	47.01											
Intersection LOS	D											
Intersection V/C	0.814											

Emissions

Vehicle Miles Traveled [mph]	5.48	33.50	14.61	4.77	29.61	3.89	6.74	6.51	9.43	5.50	2.98
Stops [stops/h]	277.32	1126.49	524.24	165.31	436.32	41.83	272.76	268.72	335.18	198.34	102.34
Fuel consumption [US gal/h]	8.87	22.05	11.05	3.84	9.15	0.86	5.80	5.78	6.78	4.02	2.07
CO [g/h]	620.00	1541.28	772.73	268.68	639.37	60.33	405.23	403.93	474.08	280.81	144.92
NOx [g/h]	120.63	299.88	150.35	52.27	124.40	11.74	78.84	78.59	92.24	54.63	28.20
VOC [g/h]	143.69	357.21	179.09	62.27	148.18	13.98	93.92	93.61	109.87	65.08	33.59

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.097	2.349	2.789
Crosswalk LOS	F	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.59	25.29	54.12	52.45
l_b,int, Bicycle LOS Score for Intersection	3.424	2.891	2.022	2.807
Bicycle LOS	C	C	B	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Version 2024 (SP 0-6) 2/10/2026

Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	31.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.698

Intersection Setup

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration	┐|		┣		┳┓	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

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Volumes

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Base Volume Input [veh/h]	311	704	407	103	251	522
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	311	704	407	103	251	522
Peak Hour Factor	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	80	181	105	27	65	134
Total Analysis Volume [veh/h]	320	725	419	106	259	538
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	12		0		11	
v_di, Inbound Pedestrian Volume crossing m	11		0		12	
v_co, Outbound Pedestrian Volume crossing	0		5		6	
v_ci, Inbound Pedestrian Volume crossing mi	0		6		5	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	27		9		11	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	34	35	70	0	35	34
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	18	18	0	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	2.5	6.1	0.0	0.0	0.0	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	38	91	53	0	39	38
Lead / Lag	Lag	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	2.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	Yes	Yes		No	No
Pedestrian Recall	No	No	No		Yes	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.50	8.10	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.50	6.10	0.00	0.00	0.00
g_i, Effective Green Time [s]	26	86	61	34	65
g / C, Green / Cycle	0.20	0.66	0.47	0.26	0.50
(v / s)_i Volume / Saturation Flow Rate	0.18	0.39	0.29	0.15	0.34
s, saturation flow rate [veh/h]	1781	1870	1789	1781	1575
c, Capacity [veh/h]	361	1232	839	469	758
d1, Uniform Delay [s]	50.38	12.34	25.97	41.28	26.44
k, delay calibration	0.22	0.50	0.50	0.08	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	13.81	2.06	3.52	0.80	5.55
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.89	0.59	0.63	0.55	0.71
d, Delay for Lane Group [s/veh]	64.19	14.41	29.49	42.08	31.99
Lane Group LOS	E	B	C	D	C
Critical Lane Group	No	No	Yes	Yes	Yes
50th-Percentile Queue Length [veh/ln]	11.40	11.58	12.75	7.30	14.08
50th-Percentile Queue Length [ft/ln]	285.11	289.45	318.67	182.47	351.92
95th-Percentile Queue Length [veh/ln]	16.94	17.16	18.60	11.73	20.23
95th-Percentile Queue Length [ft/ln]	423.56	428.96	465.06	293.23	505.75

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	64.19	14.41	29.49	29.49	42.08	31.99
Movement LOS	E	B	C	C	D	C
d_A, Approach Delay [s/veh]	29.65		29.49		35.27	
Approach LOS	C		C		D	
d_I, Intersection Delay [s/veh]	31.51					
Intersection LOS	C					
Intersection V/C	0.698					

Emissions

Vehicle Miles Traveled [mph]	30.66	69.46	12.45	6.13	12.73
Stops [stops/h]	315.81	320.62	352.99	202.12	389.82
Fuel consumption [US gal/h]	7.72	7.18	6.28	3.59	6.18
CO [g/h]	539.86	502.20	438.94	250.69	431.97
NOx [g/h]	105.04	97.71	85.40	48.77	84.05
VOC [g/h]	125.12	116.39	101.73	58.10	100.11

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.718	0.000	2.355
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1331	746	531
d_b, Bicycle Delay [s]	7.38	25.66	35.27
l_b,int, Bicycle LOS Score for Intersection	3.284	2.426	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	39.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.709

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	2	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Base Volume Input [veh/h]	21	772	126	367	581	4	95	89	18	257	7	349
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	21	772	126	367	581	4	95	89	18	257	7	349
Peak Hour Factor	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	196	32	93	147	1	24	23	5	65	2	89
Total Analysis Volume [veh/h]	21	783	128	372	589	4	96	90	18	261	7	354
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	6			1			6			0		
v_di, Inbound Pedestrian Volume crossing m	6			0			6			1		
v_co, Outbound Pedestrian Volume crossing	1			7			8			2		
v_ci, Inbound Pedestrian Volume crossing mi	2			8			7			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	18			14			5			21		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	10	35	35	10	50	0	35	35	35	50	35	50
Amber [s]	3.5	3.5	3.5	3.5	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.5	6.1	0.0	0.0	0.0	0.0	6.1	0.0	6.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	10	53	38	39	82	0	53	38	53	82	38	82
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	2.0	3.0	3.0	3.0	2.5	0.0	3.0	3.0	3.0	2.5	3.0	2.5
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	No			No			No	
Pedestrian Recall	No	No		Yes	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	130	130	130	130	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.50	8.10	8.10	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.50	6.10	6.10	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	5	51	51	31	71	71	42	42	42	42
g / C, Green / Cycle	0.04	0.39	0.39	0.24	0.55	0.55	0.32	0.32	0.32	0.32
(v / s)_i Volume / Saturation Flow Rate	0.01	0.22	0.08	0.21	0.16	0.16	0.09	0.06	0.26	0.23
s, saturation flow rate [veh/h]	1781	3560	1525	1781	1870	1864	1020	1807	1036	1546
c, Capacity [veh/h]	71	1402	601	421	1024	1020	95	578	386	494
d1, Uniform Delay [s]	60.64	30.62	25.98	47.90	15.83	15.83	63.95	31.99	45.25	38.70
k, delay calibration	0.04	0.50	0.50	0.32	0.50	0.50	0.11	0.11	0.39	0.31
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.85	1.61	0.81	16.06	0.72	0.72	45.93	0.15	7.77	5.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.30	0.56	0.21	0.88	0.29	0.29	1.01	0.19	0.69	0.72
d, Delay for Lane Group [s/veh]	61.49	32.23	26.79	63.96	16.55	16.55	109.88	32.15	53.02	44.18
Lane Group LOS	E	C	C	E	B	B	F	C	D	D
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.69	9.75	2.75	13.38	4.88	4.87	4.41	2.56	8.92	10.61
50th-Percentile Queue Length [ft/ln]	17.19	243.79	68.83	334.54	122.06	121.80	110.15	64.10	223.09	265.36
95th-Percentile Queue Length [veh/ln]	1.24	14.87	4.96	19.38	8.51	8.49	7.90	4.62	13.82	15.96
95th-Percentile Queue Length [ft/ln]	30.94	371.82	123.89	484.52	212.65	212.30	197.40	115.38	345.57	398.94

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	61.49	32.23	26.79	63.96	16.55	16.55	109.88	32.15	32.15	53.02	53.02	44.18
Movement LOS	E	C	C	E	B	B	F	C	C	D	D	D
d_A, Approach Delay [s/veh]		32.14			34.83			68.73			47.99	
Approach LOS		C			C			E			D	
d_I, Intersection Delay [s/veh]	39.45											
Intersection LOS	D											
Intersection V/C	0.709											

Emissions

Vehicle Miles Traveled [mph]	0.50	18.56	3.03	35.64	28.44	28.37	6.48	7.29	6.34	8.37
Stops [stops/h]	19.04	540.09	76.24	370.57	135.20	134.92	122.01	71.00	247.11	293.94
Fuel consumption [US gal/h]	0.42	9.90	1.39	8.99	3.10	3.09	2.77	1.24	4.52	5.15
CO [g/h]	29.70	692.34	96.94	628.17	216.72	216.24	193.39	86.80	315.79	360.06
NOx [g/h]	5.78	134.70	18.86	122.22	42.17	42.07	37.63	16.89	61.44	70.05
VOC [g/h]	6.88	160.46	22.47	145.58	50.23	50.12	44.82	20.12	73.19	83.45

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	3.275	2.954	2.009	2.352
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	746	1192	515	515
d_b, Bicycle Delay [s]	25.78	10.68	35.91	36.20
l_b,int, Bicycle LOS Score for Intersection	2.329	2.356	1.896	2.586
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	61.1
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.796

Intersection Setup

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Base Volume Input [veh/h]	105	415	330	234	451	27	31	374	277	465	151	374
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	105	415	330	234	451	27	31	374	277	465	151	374
Peak Hour Factor	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	108	86	61	118	7	8	98	72	121	39	98
Total Analysis Volume [veh/h]	110	433	344	244	471	28	32	390	289	485	158	390
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	12			6			12			6		
v_di, Inbound Pedestrian Volume crossing m	12			6			12			6		
v_co, Outbound Pedestrian Volume crossing	4			5			5			5		
v_ci, Inbound Pedestrian Volume crossing mi	5			5			5			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			14			50			19		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	45	0	30	30	30	0	40	0	45	45	45
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	38	0	29	29	29	0	40	0	34	34	34
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	0	5	0	5	5	5
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	141	141	141	141	141	141	141	141	141	141	141	141	141
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	25	25	25	25	23	23	23	32	32	32	43	43	43
g / C, Green / Cycle	0.18	0.18	0.18	0.18	0.16	0.16	0.16	0.23	0.23	0.23	0.30	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.06	0.15	0.15	0.15	0.14	0.14	0.14	0.02	0.21	0.20	0.18	0.18	0.25
s, saturation flow rate [veh/h]	1781	1870	1722	1544	1781	1869	1813	1781	1870	1447	1781	1824	1548
c, Capacity [veh/h]	315	331	305	273	290	304	295	402	422	327	541	554	470
d1, Uniform Delay [s]	50.88	56.12	56.25	56.13	57.19	57.16	57.28	43.02	53.38	51.64	41.69	41.48	45.27
k, delay calibration	0.11	0.11	0.11	0.11	0.17	0.17	0.18	0.11	0.26	0.24	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.66	5.82	6.78	8.24	9.66	9.08	10.22	0.08	17.70	15.46	4.75	4.39	15.44
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.35	0.84	0.85	0.87	0.83	0.83	0.84	0.08	0.92	0.88	0.59	0.58	0.83
d, Delay for Lane Group [s/veh]	51.54	61.93	63.03	64.37	66.85	66.24	67.50	43.10	71.08	67.10	46.44	45.87	60.72
Lane Group LOS	D	E	E	E	E	E	E	D	E	E	D	D	E
Critical Lane Group	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.50	10.17	9.58	8.82	9.14	9.52	9.45	0.90	15.60	11.10	10.36	10.27	14.72
50th-Percentile Queue Length [ft/ln]	87.51	254.1	239.6	220.6	228.51	237.92	236.16	22.59	389.98	277.41	258.96	256.78	368.10
95th-Percentile Queue Length [veh/ln]	6.30	15.40	14.66	13.70	14.10	14.58	14.49	1.63	22.08	16.56	15.64	15.53	21.02
95th-Percentile Queue Length [ft/ln]	157.5	384.9	366.5	342.4	352.46	364.40	362.17	40.66	551.92	413.98	390.92	388.18	525.42

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	51.54	62.32	64.01	66.85	66.83	67.50	43.10	71.08	67.10	46.24	45.87	60.72
Movement LOS	D	E	E	E	E	E	D	E	E	D	D	E
d_A, Approach Delay [s/veh]	61.62			66.86			68.20			51.65		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	61.11											
Intersection LOS	E											
Intersection V/C	0.796											

Emissions

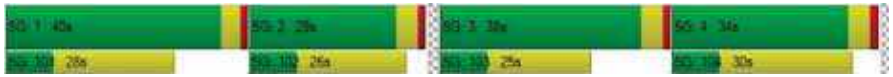
Vehicle Miles Traveled [mph]	2.61	6.62	6.17	5.63	5.73	6.00	5.89	0.76	9.24	6.85	137.43	137.43	166.71
Stops [stops/h]	89.37	259.6	244.7	225.3	233.37	242.98	241.18	23.07	398.28	283.31	264.47	262.24	375.93
Fuel consumption [US gal/h]	1.75	5.22	4.95	4.59	4.81	5.00	4.99	0.44	8.22	5.79	10.23	10.19	13.76
CO [g/h]	122.6	365.1	345.7	320.6	336.38	349.41	348.54	30.71	574.69	404.91	715.26	712.05	961.64
NOx [g/h]	23.87	71.04	67.27	62.38	65.45	67.98	67.81	5.97	111.81	78.78	139.16	138.54	187.10
VOC [g/h]	28.43	84.62	80.13	74.31	77.96	80.98	80.78	7.12	133.19	93.84	165.77	165.02	222.87

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.01	59.01	59.01	59.01
l_p,int, Pedestrian LOS Score for Intersectio	4.405	2.632	2.397	2.810
Crosswalk LOS	E	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	472	345	506	416
d_b, Bicycle Delay [s]	41.21	48.63	40.33	44.67
l_b,int, Bicycle LOS Score for Intersection	3.116	2.173	2.733	3.264
Bicycle LOS	C	B	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



A311

Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	29.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.835

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	130	45	129	76	108	7	3	949	129	58	954	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	130	45	129	76	108	7	3	949	129	58	954	8
Peak Hour Factor	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	35	12	35	20	29	2	1	255	35	16	257	2
Total Analysis Volume [veh/h]	140	48	139	82	116	8	3	1021	139	62	1026	9
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	4			2			3			1		
v_di, Inbound Pedestrian Volume crossing m	3			1			4			2		
v_co, Outbound Pedestrian Volume crossing	2			1			1			2		
v_ci, Inbound Pedestrian Volume crossing mi	2			1			1			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	7			5			15			12		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	69
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	5	24	5	24	24	24	60	60	60	60	60	60
Amber [s]	3.0	3.1	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	5	7	5	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	10	15	10	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	9	47	9	47	47	47	23	23	23	23	23	23
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	5	5	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	70	70	70	70	70	70	70	70
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	17	17	17	17	45	45	45	45
g / C, Green / Cycle	0.25	0.25	0.25	0.25	0.64	0.64	0.64	0.64
(v / s)_i Volume / Saturation Flow Rate	0.11	0.12	0.07	0.07	0.01	0.64	0.13	0.55
s, saturation flow rate [veh/h]	1263	1624	1193	1844	545	1822	484	1867
c, Capacity [veh/h]	314	402	250	457	183	1158	103	1186
d1, Uniform Delay [s]	27.32	22.39	28.88	21.24	25.64	12.77	35.00	10.46
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.00	0.84	0.76	0.32	0.16	26.97	23.31	9.01
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.45	0.47	0.33	0.27	0.02	1.00	0.60	0.87
d, Delay for Lane Group [s/veh]	28.31	23.23	29.63	21.55	25.81	39.74	58.31	19.47
Lane Group LOS	C	C	C	C	C	F	E	B
Critical Lane Group	No	Yes	No	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.22	2.63	1.32	1.63	0.05	22.70	1.71	13.24
50th-Percentile Queue Length [ft/ln]	55.53	65.66	33.01	40.84	1.26	567.45	42.71	330.99
95th-Percentile Queue Length [veh/ln]	4.00	4.73	2.38	2.94	0.09	30.57	3.07	19.21
95th-Percentile Queue Length [ft/ln]	99.95	118.19	59.43	73.50	2.27	764.19	76.87	480.18

A313

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	28.31	23.23	23.23	29.63	21.55	21.55	25.81	39.74	39.74	58.31	19.47	19.47
Movement LOS	C	C	C	C	C	C	C	D	D	E	B	B
d_A, Approach Delay [s/veh]	25.40			24.77			39.70			21.67		
Approach LOS	C			C			D			C		
d_I, Intersection Delay [s/veh]	29.84											
Intersection LOS	C											
Intersection V/C	0.835											

Emissions

Vehicle Miles Traveled [mph]	8.08	10.79	7.10	10.74	1.28	495.87	5.96	99.54
Stops [stops/h]	114.22	135.08	67.92	84.01	2.59	1167.32	87.86	680.90
Fuel consumption [US gal/h]	1.61	1.89	1.07	1.35	0.08	36.16	1.34	11.19
CO [g/h]	112.42	131.93	75.10	94.30	5.83	2527.34	93.72	782.15
NOx [g/h]	21.87	25.67	14.61	18.35	1.13	491.73	18.24	152.18
VOC [g/h]	26.05	30.58	17.40	21.85	1.35	585.74	21.72	181.27

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.86	24.86	24.86	24.86
l_p,int, Pedestrian LOS Score for Intersectio	2.189	2.003	2.758	2.709
Crosswalk LOS	B	B	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1226	1226	540	540
d_b, Bicycle Delay [s]	5.26	5.26	18.79	18.76
l_b,int, Bicycle LOS Score for Intersection	2.099	1.900	3.479	3.370
Bicycle LOS	B	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Version 2024 (SP 0-6) 2/10/2026

Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	28.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.930

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	9	8	8	211	7	52	32	1092	5	9	1011	137
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	8	8	211	7	52	32	1092	5	9	1011	137
Peak Hour Factor	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	2	2	56	2	14	9	290	1	2	269	36
Total Analysis Volume [veh/h]	10	9	9	224	7	55	34	1161	5	10	1075	146
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	15			19			19			15		
v_di, Inbound Pedestrian Volume crossing m	15			19			19			15		
v_co, Outbound Pedestrian Volume crossing	11			8			10			8		
v_ci, Inbound Pedestrian Volume crossing mi	10			8			11			8		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			4			8			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	80.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	30	0	30	30	30	90	90	90	90	90	90
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	26	26	86	86	86	86
g / C, Green / Cycle	0.22	0.22	0.72	0.72	0.72	0.72
(v / s)_i Volume / Saturation Flow Rate	0.02	0.21	0.07	0.62	0.02	0.67
s, saturation flow rate [veh/h]	1696	1389	457	1868	481	1823
c, Capacity [veh/h]	405	351	125	1340	173	1307
d1, Uniform Delay [s]	37.64	46.19	47.67	12.77	35.94	14.54
k, delay calibration	0.11	0.41	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	15.42	5.29	7.94	0.64	13.43
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.07	0.81	0.27	0.87	0.06	0.93
d, Delay for Lane Group [s/veh]	37.71	61.61	52.96	20.71	36.58	27.97
Lane Group LOS	D	E	D	C	D	C
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.68	9.87	1.14	24.02	0.26	29.16
50th-Percentile Queue Length [ft/ln]	16.93	246.83	28.42	600.58	6.55	728.99
95th-Percentile Queue Length [veh/ln]	1.22	15.03	2.05	32.06	0.47	38.02
95th-Percentile Queue Length [ft/ln]	30.47	375.66	51.16	801.54	11.80	950.39

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	37.71	37.71	37.71	61.61	61.61	61.61	52.96	20.71	20.71	36.58	27.97	27.97
Movement LOS	D	D	D	E	E	E	D	C	C	D	C	C
d_A, Approach Delay [s/veh]	37.71			61.61			21.62			28.04		
Approach LOS	D			E			C			C		
d_I, Intersection Delay [s/veh]	28.83											
Intersection LOS	C											
Intersection V/C	0.930											

Emissions

Vehicle Miles Traveled [mph]	0.80	6.42	3.27	112.14	0.24	28.77
Stops [stops/h]	20.31	296.19	34.11	720.70	7.87	874.79
Fuel consumption [US gal/h]	0.33	5.49	0.64	12.72	0.13	12.97
CO [g/h]	22.98	383.48	45.03	889.19	8.92	906.37
NOx [g/h]	4.47	74.61	8.76	173.00	1.74	176.35
VOC [g/h]	5.33	88.88	10.44	206.08	2.07	210.06

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
l_p,int, Pedestrian LOS Score for Intersectio	1.763	2.009	2.602	3.126
Crosswalk LOS	A	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	432	432	1432	1432
d_b, Bicycle Delay [s]	36.97	36.97	4.86	4.85
l_b,int, Bicycle LOS Score for Intersection	1.606	2.032	3.540	3.591
Bicycle LOS	A	B	D	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	23.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.766

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	39	40	85	54	34	14	11	1265	12	46	1087	29
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	39	40	85	54	34	14	11	1265	12	46	1087	29
Peak Hour Factor	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	10	22	14	9	4	3	322	3	12	277	7
Total Analysis Volume [veh/h]	40	41	87	55	35	14	11	1288	12	47	1107	30
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			2			9			1		
v_di, Inbound Pedestrian Volume crossing m	9			1			10			2		
v_co, Outbound Pedestrian Volume crossing	5			4			5			5		
v_ci, Inbound Pedestrian Volume crossing mi	5			5			4			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			3			9		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	122	122	122	122	122	122	122	122	122	122
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	13	13	7	7	7	1	79	79	4	82
g / C, Green / Cycle	0.11	0.11	0.06	0.06	0.06	0.01	0.65	0.65	0.03	0.67
(v / s)_i Volume / Saturation Flow Rate	0.02	0.08	0.03	0.02	0.01	0.01	0.35	0.35	0.03	0.61
s, saturation flow rate [veh/h]	1781	1620	1781	1849	1435	1781	1870	1862	1781	1860
c, Capacity [veh/h]	195	177	109	113	88	18	1210	1205	62	1248
d1, Uniform Delay [s]	49.38	52.41	54.99	54.96	54.09	59.97	11.64	11.65	58.24	16.92
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.23	0.11	0.35
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.52	5.49	2.44	2.26	0.83	27.99	0.80	0.80	17.38	8.56
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.21	0.72	0.41	0.40	0.16	0.60	0.54	0.54	0.76	0.91
d, Delay for Lane Group [s/veh]	49.90	57.91	57.43	57.22	54.92	87.97	12.44	12.45	75.62	25.48
Lane Group LOS	D	E	E	E	D	F	B	B	E	C
Critical Lane Group	No	Yes	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.15	4.08	1.44	1.45	0.44	0.48	9.52	9.50	1.74	27.68
50th-Percentile Queue Length [ft/ln]	28.75	102.04	35.89	36.30	11.00	12.06	238.08	237.58	43.58	691.99
95th-Percentile Queue Length [veh/ln]	2.07	7.35	2.58	2.61	0.79	0.87	14.58	14.56	3.14	36.31
95th-Percentile Queue Length [ft/ln]	51.75	183.66	64.61	65.35	19.81	21.71	364.60	363.97	78.45	907.70

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	49.90	57.91	57.91	57.39	57.22	54.92	87.97	12.44	12.45	75.62	25.48	25.48
Movement LOS	D	E	E	E	E	D	F	B	B	E	C	C
d_A, Approach Delay [s/veh]	56.00			57.00			13.08			27.47		
Approach LOS	E			E			B			C		
d_I, Intersection Delay [s/veh]	23.49											
Intersection LOS	C											
Intersection V/C	0.766											

Emissions

Vehicle Miles Traveled [mph]	1.82	5.81	1.48	1.51	0.47	0.26	15.39	15.34	5.89	142.49
Stops [stops/h]	34.06	120.86	42.51	43.00	13.03	14.28	281.99	281.40	51.62	819.63
Fuel consumption [US gal/h]	0.62	2.23	0.64	0.65	0.19	0.26	3.42	3.41	1.19	15.45
CO [g/h]	43.23	156.09	44.62	45.14	13.47	18.41	239.16	238.66	82.90	1079.80
NOx [g/h]	8.41	30.37	8.68	8.78	2.62	3.58	46.53	46.43	16.13	210.09
VOC [g/h]	10.02	36.18	10.34	10.46	3.12	4.27	55.43	55.31	19.21	250.25

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	50.29	50.29	50.29	50.29
l_p,int, Pedestrian LOS Score for Intersectio	2.026	2.161	2.648	2.821
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	494	494	329	329
d_b, Bicycle Delay [s]	34.51	34.51	42.50	42.62
l_b,int, Bicycle LOS Score for Intersection	1.837	1.731	2.641	3.513
Bicycle LOS	A	A	B	D

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	20.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.906

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	545	54	52	1546	1203	406
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	545	54	52	1546	1203	406
Peak Hour Factor	0.9590	0.9590	0.9590	0.9590	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	142	14	14	403	314	106
Total Analysis Volume [veh/h]	568	56	54	1612	1254	423
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	2		0		1	
v_ci, Inbound Pedestrian Volume crossing mi	1		0		2	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	3		10		6	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	31	31
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	40	13	100	87	87
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

A320

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	74	74	74	74	74	74
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	25	25	3	39	32	32
g / C, Green / Cycle	0.34	0.34	0.04	0.52	0.44	0.44
(v / s)_i Volume / Saturation Flow Rate	0.32	0.04	0.03	0.45	0.35	0.27
s, saturation flow rate [veh/h]	1781	1567	1781	3560	3560	1550
c, Capacity [veh/h]	613	540	69	1869	1562	680
d1, Uniform Delay [s]	23.41	16.52	35.33	15.31	18.04	15.92
k, delay calibration	0.15	0.04	0.04	0.15	0.15	0.16
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	8.72	0.03	6.88	1.81	1.42	1.41
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.93	0.10	0.78	0.86	0.80	0.62
d, Delay for Lane Group [s/veh]	32.13	16.55	42.21	17.12	19.46	17.33
Lane Group LOS	C	B	D	B	B	B
Critical Lane Group	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	10.33	0.62	1.07	10.61	8.47	5.12
50th-Percentile Queue Length [ft/ln]	258.25	15.50	26.81	265.30	211.68	128.11
95th-Percentile Queue Length [veh/ln]	15.60	1.12	1.93	15.95	13.24	8.84
95th-Percentile Queue Length [ft/ln]	390.02	27.91	48.27	398.86	330.98	220.92

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	32.13	16.55	42.21	17.12	19.46	17.33
Movement LOS	C	B	D	B	B	B
d_A, Approach Delay [s/veh]	30.73		17.93		18.92	
Approach LOS	C		B		B	
d_I, Intersection Delay [s/veh]	20.36					
Intersection LOS	C					
Intersection V/C	0.906					

Emissions

Vehicle Miles Traveled [mph]	13.45	1.33	6.77	202.01	29.67	10.01
Stops [stops/h]	502.32	30.16	52.16	1032.05	823.47	249.18
Fuel consumption [US gal/h]	7.04	0.41	1.03	19.63	12.29	3.75
CO [g/h]	492.26	28.65	72.04	1372.39	859.14	261.96
NOx [g/h]	95.78	5.57	14.02	267.02	167.16	50.97
VOC [g/h]	114.09	6.64	16.70	318.07	199.11	60.71

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	26.83	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.287	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	967	2553	2202
d_b, Bicycle Delay [s]	9.89	2.84	0.38
l_b,int, Bicycle LOS Score for Intersection	1.560	2.934	2.943
Bicycle LOS	A	C	C

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	73.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.376

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	782	0	337	0	1655	375	0	1145	1475	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	782	0	337	0	1655	375	0	1145	1475	0	0	0
Peak Hour Factor	0.9624	1.0000	0.9624	1.0000	0.9624	0.9624	1.0000	0.9624	0.9624	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	203	0	88	0	430	97	0	297	383	0	0	0
Total Analysis Volume [veh/h]	813	0	350	0	1720	390	0	1190	1533	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			10			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	33	0	0	0	112	0	0	112	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	5	0	0	5	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				Yes			Yes				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	145	145	145	145	145	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
I2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	29	29	108	108	108	
g / C, Green / Cycle	0.20	0.20	0.74	0.74	0.74	
(v / s)_i Volume / Saturation Flow Rate	0.24	0.12	0.34	0.23	0.99	
s, saturation flow rate [veh/h]	3459	2813	5094	5094	1550	
c, Capacity [veh/h]	692	563	3794	3794	1154	
d1, Uniform Delay [s]	58.00	52.99	7.13	6.16	17.24	
k, delay calibration	0.13	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	83.32	1.13	0.39	0.22	153.69	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	1.18	0.62	0.45	0.31	1.33	
d, Delay for Lane Group [s/veh]	141.32	54.12	7.52	6.38	170.93	
Lane Group LOS	F	D	A	A	F	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	20.69	5.95	6.54	3.90	80.45	
50th-Percentile Queue Length [ft/ln]	517.19	148.80	163.45	97.57	2011.32	
95th-Percentile Queue Length [veh/ln]	30.58	9.95	10.73	7.03	118.89	
95th-Percentile Queue Length [ft/ln]	764.45	248.82	268.29	175.63	2972.31	

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	141.32	0.00	54.12	0.00	7.52	0.00	0.00	6.38	170.93	0.00	0.00	0.00
Movement LOS	F		D		A			A	F			
d_A, Approach Delay [s/veh]	115.08			6.17			99.02			0.00		
Approach LOS	F			A			F			A		
d_I, Intersection Delay [s/veh]	73.86											
Intersection LOS	E											
Intersection V/C	1.376											

Emissions

Vehicle Miles Traveled [mph]	19.28	8.30	40.67	131.88	169.89	
Stops [stops/h]	1027.25	295.54	486.97	290.70	1997.44	
Fuel consumption [US gal/h]	29.84	5.83	7.00	8.58	71.34	
CO [g/h]	2086.15	407.44	489.11	599.69	4986.80	
NOx [g/h]	405.89	79.27	95.16	116.68	970.25	
VOC [g/h]	483.49	94.43	113.36	138.98	1155.74	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	63.78	0.00	63.78
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.072	0.000	1.447
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	400	1490	1490	0
d_b, Bicycle Delay [s]	46.40	4.72	4.74	72.50
l_b,int, Bicycle LOS Score for Intersection	1.560	2.506	3.057	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	185.1
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.193

Intersection Setup

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	200.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	359	0	1254	0	0	0	0	2015	684	0	2167	852
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	359	0	1254	0	0	0	0	2015	684	0	2167	852
Peak Hour Factor	0.9741	1.0000	0.9741	0.9741	0.9741	0.9741	1.0000	0.9741	0.9741	1.0000	0.9741	0.9741
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	92	0	322	0	0	0	0	517	176	0	556	219
Total Analysis Volume [veh/h]	369	0	1287	0	0	0	0	2069	702	0	2225	875
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			2			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	2.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	7	0	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	30	0	0	16	0	0	16	0
Amber [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	5	0	5	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	10	0	10	0	10	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No			No	
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	25	0	25	0	25	0	0	95	0	0	95	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	5	0	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No		No			No			No	
Maximum Recall	No		No		No			No			No	
Pedestrian Recall	No		No		No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	R	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	21	46	21	91	91	116	91
g / C, Green / Cycle	0.14	0.32	0.14	0.63	0.63	0.80	0.63
(v / s)_i Volume / Saturation Flow Rate	0.13	0.78	0.00	0.69	0.45	0.74	0.96
s, saturation flow rate [veh/h]	2752	1658	1870	3003	1556	3003	916
c, Capacity [veh/h]	410	526	296	1884	976	2402	575
d1, Uniform Delay [s]	61.32	49.50	0.00	27.00	18.01	11.20	26.02
k, delay calibration	0.11	0.50	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	7.30	656.53	0.00	52.98	4.55	7.65	243.73
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.90	2.45	0.00	1.10	0.72	0.93	1.52
d, Delay for Lane Group [s/veh]	68.62	706.03	0.00	79.98	22.56	18.85	269.75
Lane Group LOS	E	F	A	F	C	B	F
Critical Lane Group	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	7.15	57.46	0.00	29.68	16.47	16.51	56.94
50th-Percentile Queue Length [ft/ln]	178.65	1436.46	0.00	742.00	411.69	412.76	1423.61
95th-Percentile Queue Length [veh/ln]	11.53	94.99	0.00	41.67	23.12	23.17	90.70
95th-Percentile Queue Length [ft/ln]	288.25	2374.87	0.00	1041.83	578.07	579.35	2267.46

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	68.62	0.00	706.03	0.00	0.00	0.00	0.00	79.98	22.56	0.00	18.85	269.75
Movement LOS	E		F	A	A	A		F	C		B	F
d_A, Approach Delay [s/veh]	564.00			0.00			65.43			89.67		
Approach LOS	F			A			E			F		
d_I, Intersection Delay [s/veh]	185.10											
Intersection LOS	F											
Intersection V/C	1.193											

Emissions

Vehicle Miles Traveled [mph]	8.75	30.51	0.00	229.29	77.80	52.59	20.68
Stops [stops/h]	354.84	2853.11	0.00	2210.64	408.85	1229.73	1413.79
Fuel consumption [US gal/h]	7.47	201.89	0.00	55.32	8.68	17.49	56.68
CO [g/h]	522.33	14111.80	0.00	3867.05	607.04	1222.71	3962.23
NOx [g/h]	101.63	2745.64	0.00	752.39	118.11	237.90	770.91
VOC [g/h]	121.05	3270.55	0.00	896.23	140.69	283.38	918.28

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0		9.0	0.0		0.0	
M_corner, Corner Circulation Area [ft²/ped]	0.00		0.00	0.00		0.00	
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00		0.00	0.00		0.00	
d_p, Pedestrian Delay [s]	63.78		63.78	0.00		0.00	
I_p,int, Pedestrian LOS Score for Intersectio	2.784		2.165	0.000		0.000	
Crosswalk LOS	C		B	F		F	
s_b, Saturation Flow Rate of the bicycle lane	2000		2000	2000		2000	
c_b, Capacity of the bicycle lane [bicycles/h]	290		290	1255		1600	
d_b, Bicycle Delay [s]	53.02		53.02	10.07		2.91	
I_b,int, Bicycle LOS Score for Intersection	1.560		1.560	3.084		3.265	
Bicycle LOS	A		A	C		C	

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.AM.vistro
Report File: C:\...\NP AM.pdf

Scenario 27 Near-Term Plus Project AM
2/4/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road and US 101 NB Ramps	Signalized	HCM 7th Edition	WB Right	0.952	22.6	C
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	EB Left	0.924	43.9	D
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	NB Left	0.719	19.1	B
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	SB Left	0.706	31.1	C
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	SB Left	0.657	19.3	B
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	NB Left	0.633	46.5	D
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	EB Right	0.734	46.8	D
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	SB Thru	0.833	37.1	D
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	NB Left	0.530	27.1	C
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	EB Thru	0.779	59.2	E
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	SB Left	0.660	11.0	B
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.682	9.3	A
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	EB Left	0.936	49.0	D
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	WB Right	1.080	76.4	E
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	1.901	117.7	F
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	0.746	44.5	D

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V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road and US 101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	22.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.952

Intersection Setup

Name	Marsh Road (SR 84)		Marsh Road		US 101 NB Off-Ramp	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

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Volumes

Name	Marsh Road (SR 84)		Marsh Road		US 101 NB Off-Ramp	
Base Volume Input [veh/h]	1573	0	0	767	719	636
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	474	0	0	166	0	134
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2047	0	0	933	719	770
Peak Hour Factor	0.9670	1.0000	1.0000	0.9670	0.9670	0.9670
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	529	0	0	241	186	199
Total Analysis Volume [veh/h]	2117	0	0	965	744	796
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	1		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	2		0		1	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	1		1		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	60	0	0	60	60	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	30	0	0	30	60	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	No	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	57	57	28	28
g / C, Green / Cycle	0.63	0.63	0.32	0.32
(v / s)_i Volume / Saturation Flow Rate	0.59	0.27	0.22	0.28
s, saturation flow rate [veh/h]	3560	3560	3459	2813
c, Capacity [veh/h]	2253	2253	1097	892
d1, Uniform Delay [s]	14.97	8.32	26.73	29.26
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.27	0.60	0.28	1.30
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.94	0.43	0.68	0.89
d, Delay for Lane Group [s/veh]	24.24	8.92	27.00	30.55
Lane Group LOS	C	A	C	C
Critical Lane Group	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	19.30	4.34	6.77	8.04
50th-Percentile Queue Length [ft/ln]	482.60	108.62	169.30	201.05
95th-Percentile Queue Length [veh/ln]	26.51	7.76	11.04	12.69
95th-Percentile Queue Length [ft/ln]	662.74	194.09	276.00	317.32

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	24.24	0.00	0.00	8.92	27.00	30.55
Movement LOS	C			A	C	C
d_A, Approach Delay [s/veh]	24.24		8.92		28.84	
Approach LOS	C		A		C	
d_I, Intersection Delay [s/veh]	22.58					
Intersection LOS	C					
Intersection V/C	0.952					

Emissions

Vehicle Miles Traveled [mph]	165.36	22.81	17.53	18.75
Stops [stops/h]	1544.32	347.59	541.76	643.36
Fuel consumption [US gal/h]	25.78	4.61	7.80	9.28
CO [g/h]	1802.31	322.37	545.44	648.35
NOx [g/h]	350.66	62.72	106.12	126.15
VOC [g/h]	417.70	74.71	126.41	150.26

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	36.45	34.67
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.078	2.506
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	564	564	1240
d_b, Bicycle Delay [s]	23.20	23.20	6.50
l_b,int, Bicycle LOS Score for Intersection	3.306	2.356	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	43.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.924

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

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Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	889	1387	217	1109	424
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	222	89	0	284	93
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1111	1476	217	1393	517
Peak Hour Factor	1.0000	0.9590	0.9590	1.0000	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	290	385	54	363	135
Total Analysis Volume [veh/h]	0	1158	1539	217	1453	539
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1		0		2	
v_di, Inbound Pedestrian Volume crossing m	2		0		1	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	2		1		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	60	60	0	35	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	10	0	5	0
Pedestrian Clearance [s]	0	16	0	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	55	55	0	35	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	53	50	33	33
g / C, Green / Cycle	0.58	0.56	0.37	0.37
(v / s)_i Volume / Saturation Flow Rate	0.29	0.43	0.42	0.34
s, saturation flow rate [veh/h]	4000	3560	3459	1586
c, Capacity [veh/h]	2333	1994	1268	581
d1, Uniform Delay [s]	11.00	15.34	28.50	27.31
k, delay calibration	0.50	0.50	0.08	0.38
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.76	2.97	67.27	19.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	0.77	1.15	0.93
d, Delay for Lane Group [s/veh]	11.75	18.31	95.77	46.43
Lane Group LOS	B	B	F	D
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	6.20	11.51	24.81	13.65
50th-Percentile Queue Length [ft/ln]	154.98	287.87	620.32	341.20
95th-Percentile Queue Length [veh/ln]	10.28	17.08	36.03	19.71
95th-Percentile Queue Length [ft/ln]	257.06	427.00	900.66	492.67

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	11.75	18.31	0.00	95.77	46.43
Movement LOS		B	B		F	D
d_A, Approach Delay [s/veh]	11.75		18.31		82.42	
Approach LOS	B		B		F	
d_I, Intersection Delay [s/veh]	43.93					
Intersection LOS	D					
Intersection V/C	0.924					

Emissions

Vehicle Miles Traveled [mph]	144.84	138.49	34.36	12.75
Stops [stops/h]	495.94	921.19	1985.01	545.92
Fuel consumption [US gal/h]	12.02	17.94	40.70	8.63
CO [g/h]	840.24	1254.19	2844.62	603.45
NOx [g/h]	163.48	244.02	553.46	117.41
VOC [g/h]	194.73	290.67	659.27	139.86

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.45	0.00	32.09
l_p,int, Pedestrian LOS Score for Intersectio	3.038	0.000	2.613
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1120	1120	687
d_b, Bicycle Delay [s]	8.72	8.72	19.40
l_b,int, Bicycle LOS Score for Intersection	2.515	2.829	1.560
Bicycle LOS	B	C	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	19.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.719

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	1	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	1	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			30.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Base Volume Input [veh/h]	24	1304	9	212	1247	352	237	8	1	15	3	64
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	222	0	0	183	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	24	1526	9	212	1430	352	237	8	1	15	3	64
Peak Hour Factor	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	400	2	56	375	92	62	2	0	4	1	17
Total Analysis Volume [veh/h]	25	1600	9	222	1499	369	248	8	1	16	3	67
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			0			1			0		
v_di, Inbound Pedestrian Volume crossing m	1			0			2			0		
v_co, Outbound Pedestrian Volume crossing	2			0			0			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			0			0			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			1			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	135
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	4	4	8	3	8
Auxiliary Signal Groups												
Maximum Green [s]	15	60	60	20	65	65	40	40	40	0	40	0
Amber [s]	3.0	4.0	4.0	3.0	4.0	4.0	3.2	3.2	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	8	8	8	0	8	0
Pedestrian Clearance [s]	0	21	21	0	21	21	24	24	24	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	85	85	14	79	79	20	20	20	0	16	0
Lead / Lag	Lead	-	-	Lead	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	10	10	4	10	10	4	4	4	0	6	0
Vehicle Extension [s]	2.5	3.5	3.5	2.0	3.5	3.5	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	135	135	135	135	135	135	135	135	135	135
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	4.00	2.00	2.00	2.00	2.00	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	4	92	92	10	100	100	15	15	8	8
g / C, Green / Cycle	0.03	0.68	0.68	0.07	0.74	0.74	0.11	0.11	0.06	0.06
(v / s)_i Volume / Saturation Flow Rate	0.01	0.30	0.30	0.06	0.50	0.53	0.07	0.07	0.01	0.02
s, saturation flow rate [veh/h]	1781	3560	1865	3459	1870	1748	1781	1785	1794	2813
c, Capacity [veh/h]	60	2427	1271	256	1378	1288	198	198	106	167
d1, Uniform Delay [s]	63.93	9.73	9.73	61.84	9.34	10.04	57.50	57.50	60.37	61.19
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.41	0.57	1.09	3.46	2.70	3.58	2.67	2.66	0.59	1.15
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.42	0.44	0.44	0.87	0.68	0.73	0.65	0.65	0.18	0.40
d, Delay for Lane Group [s/veh]	67.34	10.30	10.82	65.30	12.04	13.62	60.17	60.16	60.96	62.34
Lane Group LOS	E	B	B	E	B	B	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.90	6.81	7.32	3.90	14.02	15.24	4.39	4.40	0.64	1.15
50th-Percentile Queue Length [ft/ln]	22.43	170.33	182.98	97.49	350.54	381.05	109.80	109.96	16.10	28.66
95th-Percentile Queue Length [veh/ln]	1.61	11.09	11.76	7.02	20.16	21.64	7.83	7.84	1.16	2.06
95th-Percentile Queue Length [ft/ln]	40.37	277.35	293.90	175.48	504.07	541.12	195.73	195.95	28.97	51.58

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	67.34	10.47	10.82	65.30	12.63	13.62	60.16	60.16	60.16	60.96	60.96	62.34
Movement LOS	E	B	B	E	B	B	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	11.35			18.40			60.16			62.03		
Approach LOS	B			B			E			E		
d_I, Intersection Delay [s/veh]	19.13											
Intersection LOS	B											
Intersection V/C	0.719											

Emissions

Vehicle Miles Traveled [mph]	5.15	217.55	113.94	27.77	116.82	116.82	3.87	3.88	1.29	4.56
Stops [stops/h]	23.92	363.38	195.18	207.98	373.91	406.45	117.12	117.29	17.17	61.14
Fuel consumption [US gal/h]	0.72	13.24	7.03	5.24	9.16	9.64	2.20	2.20	0.36	1.29
CO [g/h]	50.24	925.36	491.26	366.40	640.48	674.06	153.45	153.67	25.14	90.12
NOx [g/h]	9.78	180.04	95.58	71.29	124.61	131.15	29.86	29.90	4.89	17.53
VOC [g/h]	11.64	214.46	113.85	84.92	148.44	156.22	35.56	35.61	5.83	20.89

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.03	56.03	56.95	56.95
l_p,int, Pedestrian LOS Score for Intersectio	3.125	3.170	2.137	2.372
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1185	1096	234	175
d_b, Bicycle Delay [s]	11.20	13.78	52.65	56.22
l_b,int, Bicycle LOS Score for Intersection	2.458	3.284	1.984	1.702
Bicycle LOS	B	C	A	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	31.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.706

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Base Volume Input [veh/h]	104	886	41	25	976	384	462	24	145	23	19	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	222	0	0	183	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	104	1108	41	25	1159	384	462	24	145	23	19	17
Peak Hour Factor	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	291	11	7	304	101	121	6	38	6	5	4
Total Analysis Volume [veh/h]	109	1163	43	26	1216	403	485	25	152	24	20	18
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	12			2			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			12			2		
v_co, Outbound Pedestrian Volume crossing	5			2			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			2			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			0			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	155
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	20	80	80	18	72	72	35	35	35	0	35	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	58	58	15	58	58	37	45	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	155	155	155	155	155	155	155	155	155	155	155
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	13	103	103	5	95	95	28	28	28	11	11
g / C, Green / Cycle	0.08	0.66	0.66	0.03	0.61	0.61	0.18	0.18	0.18	0.07	0.07
(v / s)_i Volume / Saturation Flow Rate	0.06	0.32	0.33	0.01	0.44	0.46	0.14	0.14	0.10	0.01	0.02
s, saturation flow rate [veh/h]	1781	1870	1843	1781	1870	1714	1781	1789	1558	1781	1718
c, Capacity [veh/h]	149	1242	1224	56	1144	1048	326	328	286	124	120
d1, Uniform Delay [s]	69.29	12.95	12.97	73.78	20.98	21.70	60.32	60.31	57.17	68.00	68.60
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.56	1.38	1.41	2.21	4.00	5.04	3.04	3.02	1.14	0.56	1.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.73	0.49	0.49	0.46	0.72	0.75	0.78	0.78	0.53	0.19	0.32
d, Delay for Lane Group [s/veh]	71.84	14.32	14.37	75.99	24.98	26.75	63.36	63.33	58.31	68.55	69.72
Lane Group LOS	E	B	B	E	C	C	E	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.32	10.64	10.55	1.05	21.48	21.43	9.93	9.97	5.55	0.93	1.49
50th-Percentile Queue Length [ft/ln]	108.12	266.11	263.84	26.32	536.91	535.80	248.20	249.15	138.87	23.23	37.27
95th-Percentile Queue Length [veh/ln]	7.74	15.99	15.88	1.89	29.08	29.02	15.10	15.14	9.42	1.67	2.68
95th-Percentile Queue Length [ft/ln]	193.38	399.87	397.03	47.37	726.92	725.60	377.38	378.58	235.50	41.82	67.09

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	71.84	14.35	14.37	75.99	25.54	26.75	63.34	63.33	58.31	68.55	69.72	69.72
Movement LOS	E	B	B	E	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	19.11			26.64			62.19			69.27		
Approach LOS	B			C			E			E		
d_I, Intersection Delay [s/veh]	31.06											
Intersection LOS	C											
Intersection V/C	0.706											

Emissions

Vehicle Miles Traveled [mph]	17.11	95.17	94.13	5.36	170.60	162.94	29.46	29.58	17.59	1.35	2.14
Stops [stops/h]	100.44	247.22	245.12	24.45	498.81	497.77	230.58	231.46	129.02	21.58	34.63
Fuel consumption [US gal/h]	3.00	7.25	7.19	0.79	14.46	14.26	5.49	5.51	3.09	0.48	0.77
CO [g/h]	209.76	507.05	502.25	55.22	1011.03	996.72	383.73	385.19	215.96	33.45	53.70
NOx [g/h]	40.81	98.65	97.72	10.74	196.71	193.92	74.66	74.94	42.02	6.51	10.45
VOC [g/h]	48.61	117.51	116.40	12.80	234.32	231.00	88.93	89.27	50.05	7.75	12.45

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	66.89	66.89	66.89	66.89
l_p,int, Pedestrian LOS Score for Intersectio	2.992	3.106	2.399	2.008
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	689	689	529	423
d_b, Bicycle Delay [s]	33.32	33.30	41.92	48.17
l_b,int, Bicycle LOS Score for Intersection	2.644	2.917	2.652	1.662
Bicycle LOS	B	C	B	A

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	19.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.657

Intersection Setup

Name				Marsh Road			Bay Road					
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name				Marsh Road			Bay Road					
Base Volume Input [veh/h]	0	741	62	247	819	0	99	43	1	54	20	185
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	209	0	6	177	0	0	0	0	0	0	13
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	950	62	253	996	0	99	43	1	54	20	198
Peak Hour Factor	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	251	16	67	263	0	26	11	0	14	5	52
Total Analysis Volume [veh/h]	0	1003	65	267	1052	0	105	45	1	57	21	209
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			9			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			9		
v_co, Outbound Pedestrian Volume crossing	0			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			4			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	8.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	7	0	7	0	7	0	7	7	7	0	7	0
Pedestrian Clearance [s]	17	0	17	0	17	0	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	56	34	56	22	56	34	34	34	34	0	34	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
I2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	43	43	17	63	63	23	23
g / C, Green / Cycle	0.48	0.48	0.19	0.70	0.70	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.30	0.30	0.15	0.28	0.28	0.15	0.17
s, saturation flow rate [veh/h]	1870	1658	1781	1870	1870	1009	1646
c, Capacity [veh/h]	931	790	338	1308	1308	319	458
d1, Uniform Delay [s]	17.69	17.72	34.73	5.65	5.65	30.26	30.59
k, delay calibration	0.50	0.50	0.11	0.50	0.50	0.23	0.24
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.94	3.90	4.12	0.92	0.92	2.32	3.14
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.64	0.79	0.40	0.40	0.47	0.63
d, Delay for Lane Group [s/veh]	20.63	21.62	38.84	6.57	6.57	32.58	33.72
Lane Group LOS	C	C	D	A	A	C	C
Critical Lane Group	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	9.04	8.24	5.77	3.57	3.57	3.14	5.88
50th-Percentile Queue Length [ft/ln]	226.02	205.90	144.28	89.20	89.20	78.51	146.99
95th-Percentile Queue Length [veh/ln]	13.97	12.94	9.71	6.42	6.42	5.65	9.86
95th-Percentile Queue Length [ft/ln]	349.30	323.56	242.77	160.56	160.56	141.31	246.41

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	20.63	21.06	21.62	38.84	6.57	6.57	32.58	32.58	32.58	33.72	33.72	33.72
Movement LOS	C	C	C	D	A	A	C	C	C	C	C	C
d_A, Approach Delay [s/veh]		21.10			13.10			32.58			33.72	
Approach LOS		C			B			C			C	
d_I, Intersection Delay [s/veh]	19.26											
Intersection LOS	B											
Intersection V/C	0.657											

Emissions

Vehicle Miles Traveled [mph]	357.83	318.43	41.91	82.56	82.56	11.73	443.40
Stops [stops/h]	361.63	329.44	230.84	142.72	142.72	125.61	235.19
Fuel consumption [US gal/h]	19.10	17.14	5.44	4.92	4.92	2.01	21.52
CO [g/h]	1335.21	1198.20	380.53	344.18	344.18	140.54	1504.40
NOx [g/h]	259.78	233.13	74.04	66.97	66.97	27.34	292.70
VOC [g/h]	309.45	277.69	88.19	79.77	79.77	32.57	348.66

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	28.9
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	20.74
l_p,int, Pedestrian LOS Score for Intersectio	2.743	3.048	1.784	2.017
Crosswalk LOS	B	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	642	1131	651	651
d_b, Bicycle Delay [s]	20.76	8.51	20.47	20.47
l_b,int, Bicycle LOS Score for Intersection	2.441	2.648	1.809	2.033
Bicycle LOS	B	B	A	B

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	46.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.633

Intersection Setup

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

A340

Volumes

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	150	76	13	88	104	54	25	393	44	9	427	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	95	0	51	0	0	1	0	100	74	8	61	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	245	76	64	88	104	55	25	493	118	17	488	12
Peak Hour Factor	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	65	20	17	23	28	15	7	131	31	5	130	3
Total Analysis Volume [veh/h]	261	81	68	94	111	59	27	526	126	18	521	13
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			7			6		
v_di, Inbound Pedestrian Volume crossing m	7			6			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			25			16		
v_ci, Inbound Pedestrian Volume crossing mi	16			25			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	19			11			39			21		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	26	30	26	30	26	20	71	71	20	71	71
Amber [s]	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	28	28	28	28	28	28	10	44	44	10	44	44
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	5	4	4	5	5	5
Vehicle Extension [s]	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	Yes		No	Yes	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	149	149	149	149	149	149	149	149
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	0.00	2.70	0.00	2.70
g_i, Effective Green Time [s]	26	26	30	30	79	72	79	71
g / C, Green / Cycle	0.17	0.17	0.20	0.20	0.53	0.48	0.53	0.48
(v / s)_i Volume / Saturation Flow Rate	0.15	0.09	0.05	0.10	0.03	0.37	0.02	0.29
s, saturation flow rate [veh/h]	1781	1637	1781	1720	941	1785	849	1860
c, Capacity [veh/h]	310	285	358	346	385	857	286	884
d1, Uniform Delay [s]	59.66	56.01	50.32	52.89	20.25	31.75	23.62	28.80
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	23.25	6.71	1.78	4.94	0.35	6.30	0.09	3.05
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.84	0.52	0.26	0.49	0.07	0.76	0.06	0.60
d, Delay for Lane Group [s/veh]	82.90	62.72	52.10	57.83	20.60	38.05	23.72	31.85
Lane Group LOS	F	E	D	E	C	D	C	C
Critical Lane Group	Yes	No	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	11.59	5.67	3.20	6.22	0.49	20.65	0.31	14.87
50th-Percentile Queue Length [ft/ln]	289.74	141.74	80.01	155.51	12.31	516.31	7.72	371.71
95th-Percentile Queue Length [veh/ln]	17.17	9.57	5.76	10.31	0.89	28.11	0.56	21.19
95th-Percentile Queue Length [ft/ln]	429.31	239.37	144.01	257.77	22.16	702.64	13.90	529.80

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	82.90	62.72	62.72	52.10	57.83	57.83	20.60	38.05	38.05	23.72	31.85	31.85
Movement LOS	F	E	E	D	E	E	C	D	D	C	C	C
d_A, Approach Delay [s/veh]	75.57			55.79			37.35			31.59		
Approach LOS	E			E			D			C		
d_I, Intersection Delay [s/veh]	46.46											
Intersection LOS	D											
Intersection V/C	0.633											

Emissions

Vehicle Miles Traveled [mph]	149.35	85.26	2.23	4.03	6.41	154.75	3.62	107.54
Stops [stops/h]	279.57	136.77	77.20	150.06	11.88	498.20	7.45	358.67
Fuel consumption [US gal/h]	12.10	6.17	1.39	2.76	0.44	14.17	0.28	9.87
CO [g/h]	845.48	431.08	97.37	192.74	30.94	990.53	19.38	689.91
NOx [g/h]	164.50	83.87	18.94	37.50	6.02	192.72	3.77	134.23
VOC [g/h]	195.95	99.91	22.57	44.67	7.17	229.57	4.49	159.89

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	64.02	64.02	64.02	64.02
l_p,int, Pedestrian LOS Score for Intersectio	2.193	2.087	2.526	2.367
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	312	312	527	527
d_b, Bicycle Delay [s]	53.65	53.43	41.30	40.92
l_b,int, Bicycle LOS Score for Intersection	2.236	1.995	2.680	2.470
Bicycle LOS	B	A	B	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	46.8
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.734

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

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Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	91	660	236	89	1093	26	44	252	62	341	145	60
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	9	64	72	61	40	43	109	41	21	98	7	52
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	100	724	308	150	1133	69	153	293	83	439	152	112
Peak Hour Factor	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	199	85	41	311	19	42	80	23	120	42	31
Total Analysis Volume [veh/h]	110	795	338	165	1244	76	168	322	91	482	167	123
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			10			0			10		
v_di, Inbound Pedestrian Volume crossing m	0			10			0			10		
v_co, Outbound Pedestrian Volume crossing	0			11			12			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			12			11			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			3			8			2		

Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.0	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	Yes	Yes		Yes	Yes			Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes			No			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.00	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	1.00	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	17	60	60	24	67	67	24	24	29	29	29
g / C, Green / Cycle	0.11	0.40	0.40	0.16	0.45	0.45	0.16	0.16	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.06	0.22	0.22	0.09	0.35	0.05	0.16	0.16	0.14	0.09	0.08
s, saturation flow rate [veh/h]	1781	3560	1570	1781	3560	1514	1818	1756	3459	1870	1519
c, Capacity [veh/h]	202	1422	627	285	1588	675	291	281	669	362	294
d1, Uniform Delay [s]	60.09	26.28	25.93	50.62	14.80	10.92	63.00	63.00	56.71	53.59	52.90
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	10.18	1.59	3.31	8.32	3.94	0.34	55.26	59.55	6.60	4.20	4.35
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.54	0.56	0.54	0.58	0.78	0.11	1.01	1.02	0.72	0.46	0.42
d, Delay for Lane Group [s/veh]	70.26	27.87	29.24	58.94	18.74	11.26	118.26	122.55	63.31	57.79	57.24
Lane Group LOS	E	C	C	E	B	B	F	F	E	E	E
Critical Lane Group	Yes	No	No	No	Yes	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	4.36	8.99	7.81	5.66	9.07	0.78	15.59	15.39	9.22	6.06	4.45
50th-Percentile Queue Length [ft/ln]	108.94	224.84	195.25	141.42	226.86	19.56	389.65	384.80	230.44	151.41	111.28
95th-Percentile Queue Length [veh/ln]	7.78	13.91	12.39	9.56	14.01	1.41	22.17	22.07	14.20	10.09	7.91
95th-Percentile Queue Length [ft/ln]	194.53	347.80	309.83	238.93	350.37	35.21	554.29	551.86	354.92	252.31	197.77

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	70.26	27.87	29.24	58.94	18.74	11.26	118.26	120.87	122.55	63.31	57.79	57.24
Movement LOS	E	C	C	E	B	B	F	F	F	E	E	E
d_A, Approach Delay [s/veh]	31.99			22.82			120.38			61.15		
Approach LOS	C			C			F			E		
d_I, Intersection Delay [s/veh]	46.76											
Intersection LOS	D											
Intersection V/C	0.734											

Emissions

Vehicle Miles Traveled [mph]	2.61	18.85	8.01	3.91	29.49	1.80	6.95	6.80	114.40	39.64	29.19
Stops [stops/h]	104.58	431.70	187.44	135.76	435.57	18.78	374.07	369.41	442.45	145.36	106.82
Fuel consumption [US gal/h]	2.46	8.47	3.73	3.15	9.14	0.38	9.42	9.48	13.36	4.40	3.22
CO [g/h]	171.86	592.30	260.45	220.12	639.11	26.85	658.46	662.94	934.08	307.46	225.41
NOx [g/h]	33.44	115.24	50.67	42.83	124.35	5.22	128.11	128.98	181.74	59.82	43.86
VOC [g/h]	39.83	137.27	60.36	51.01	148.12	6.22	152.60	153.64	216.48	71.26	52.24

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	2.966	2.266	2.735
Crosswalk LOS	F	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.53	25.33	53.98	52.14
l_b,int, Bicycle LOS Score for Intersection	2.585	2.785	2.039	2.833
Bicycle LOS	B	C	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	37.1
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.833

Intersection Setup

Name	Middlefield Road				Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Middlefield Road				Ravenswood Avenue	
Base Volume Input [veh/h]	346	473	305	62	117	376
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	27	51	133	85	34	25
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	373	524	438	147	151	401
Peak Hour Factor	0.8988	0.8988	0.8988	0.8988	0.8988	0.8988
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	104	146	122	41	42	112
Total Analysis Volume [veh/h]	415	583	487	164	168	446
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	106		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		106	
v_co, Outbound Pedestrian Volume crossing	0		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	0		2		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	18		6		8	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	44	35	70	0	33	44
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	18	18	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	48	93	45	0	37	48
Lead / Lag	Lead	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	3.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	No	Yes		Yes	No
Pedestrian Recall	No	Yes	Yes		No	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	2.60	0.00	0.00
g_i, Effective Green Time [s]	36	91	51	35	73
g / C, Green / Cycle	0.28	0.70	0.39	0.27	0.56
(v / s)_i Volume / Saturation Flow Rate	0.23	0.31	0.37	0.09	0.28
s, saturation flow rate [veh/h]	1781	1870	1776	1781	1578
c, Capacity [veh/h]	491	1310	691	479	853
d1, Uniform Delay [s]	44.47	8.46	38.31	38.33	19.03
k, delay calibration	0.26	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.27	1.10	22.74	2.01	2.29
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.85	0.44	0.94	0.35	0.52
d, Delay for Lane Group [s/veh]	53.74	9.55	61.05	40.34	21.32
Lane Group LOS	D	A	E	D	C
Critical Lane Group	Yes	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	13.74	6.92	24.06	4.63	9.04
50th-Percentile Queue Length [ft/ln]	343.50	172.93	601.62	115.70	225.90
95th-Percentile Queue Length [veh/ln]	19.82	11.23	32.11	8.16	13.97
95th-Percentile Queue Length [ft/ln]	495.48	280.76	802.75	203.90	349.14

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	53.74	9.55	61.05	61.05	40.34	21.32
Movement LOS	D	A	E	E	D	C
d_A, Approach Delay [s/veh]	27.93		61.05		26.52	
Approach LOS	C		E		C	
d_I, Intersection Delay [s/veh]	37.07					
Intersection LOS	D					
Intersection V/C	0.833					

Emissions

Vehicle Miles Traveled [mph]	39.76	55.85	681.86	29.26	77.68
Stops [stops/h]	380.50	191.55	666.41	128.16	250.23
Fuel consumption [US gal/h]	8.91	4.70	39.84	3.29	6.52
CO [g/h]	623.14	328.74	2784.73	230.08	455.43
NOx [g/h]	121.24	63.96	541.81	44.77	88.61
VOC [g/h]	144.42	76.19	645.39	53.32	105.55

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.31	0.00	54.47
I_p,int, Pedestrian LOS Score for Intersectio	2.699	0.000	2.346
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1362	623	500
d_b, Bicycle Delay [s]	6.68	30.90	36.71
I_b,int, Bicycle LOS Score for Intersection	3.206	2.634	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	27.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.530

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street					
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Middlefield Road			Middlefield Road			D Street					
Base Volume Input [veh/h]	5	517	119	175	486	23	1	7	0	141	11	301
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	73	1	1	136	21	4	11	0	2	64	2
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	590	120	176	622	44	5	18	0	143	75	303
Peak Hour Factor	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	164	33	49	173	12	1	5	0	40	21	84
Total Analysis Volume [veh/h]	6	657	134	196	692	49	6	20	0	159	83	337
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	6			7			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			6			7		
v_co, Outbound Pedestrian Volume crossing	137			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			137		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	27			8			0			13		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	28	62	25	22	57	0	62	25	62	57	25	57
Amber [s]	3.5	3.5	3.5	3.0	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.6	0.0	0.0	0.0	0.0	2.6	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	9	55	38	37	83	0	55	38	55	83	38	83
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	3.0	3.6	2.9	3.0	3.6	0.0	3.6	2.9	3.6	3.6	2.9	3.6
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	131	131	131	131	131	131	131	131	131	131
L, Total Lost Time per Cycle [s]	4.50	4.60	4.60	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.50	2.60	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	1	71	71	18	88	88	33	33	33	33
g / C, Green / Cycle	0.01	0.54	0.54	0.14	0.68	0.68	0.25	0.25	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.00	0.18	0.10	0.11	0.20	0.20	0.01	0.01	0.17	0.22
s, saturation flow rate [veh/h]	1781	3560	1335	1781	1870	1820	964	1870	1407	1539
c, Capacity [veh/h]	14	1932	725	251	1266	1232	128	469	398	386
d1, Uniform Delay [s]	64.44	16.73	14.90	54.13	8.51	8.52	56.11	37.04	45.69	46.50
k, delay calibration	0.11	0.50	0.50	0.11	0.50	0.50	0.10	0.10	0.10	0.16
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	19.07	0.48	0.56	5.28	0.60	0.62	0.14	0.04	1.43	8.69
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.43	0.34	0.18	0.78	0.30	0.30	0.05	0.04	0.61	0.87
d, Delay for Lane Group [s/veh]	83.51	17.21	15.46	59.42	9.11	9.14	56.25	37.07	47.12	55.19
Lane Group LOS	F	B	B	E	A	A	E	D	D	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.27	5.55	2.08	6.55	4.24	4.15	0.19	0.50	7.34	11.32
50th-Percentile Queue Length [ft/ln]	6.81	138.64	52.02	163.67	105.89	103.69	4.82	12.61	183.51	282.88
95th-Percentile Queue Length [veh/ln]	0.49	9.41	3.75	10.74	7.61	7.47	0.35	0.91	11.78	16.83
95th-Percentile Queue Length [ft/ln]	12.26	235.19	93.64	268.58	190.27	186.65	8.67	22.71	294.59	420.80

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	83.51	17.21	15.46	59.42	9.12	9.14	56.25	37.07	37.07	47.12	47.12	55.19
Movement LOS	F	B	B	E	A	A	E	D	D	D	D	E
d_A, Approach Delay [s/veh]	17.42			19.64			41.50			51.82		
Approach LOS	B			B			D			D		
d_I, Intersection Delay [s/veh]	27.09											
Intersection LOS	C											
Intersection V/C	0.530											

Emissions

Vehicle Miles Traveled [mph]	0.66	72.54	14.80	18.78	35.91	35.08	0.44	1.46	203.02	282.71
Stops [stops/h]	7.52	305.95	57.41	180.60	116.84	114.42	5.32	13.92	202.49	312.15
Fuel consumption [US gal/h]	0.18	7.37	1.42	4.44	2.94	2.88	0.10	0.26	11.80	17.15
CO [g/h]	12.84	514.98	99.08	310.61	205.67	201.22	7.23	18.00	824.57	1198.58
NOx [g/h]	2.50	100.20	19.28	60.43	40.02	39.15	1.41	3.50	160.43	233.20
VOC [g/h]	2.98	119.35	22.96	71.99	47.66	46.63	1.68	4.17	191.10	277.78

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.71	54.71	54.71	54.71
l_p,int, Pedestrian LOS Score for Intersectio	3.106	2.767	1.994	2.260
Crosswalk LOS	C	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	774	1203	513	513
d_b, Bicycle Delay [s]	24.86	10.40	36.05	36.29
l_b,int, Bicycle LOS Score for Intersection	2.217	2.333	1.603	2.515
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	59.2
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.779

Intersection Setup

Name	Middlefield Road			Middlefield Road						Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Middlefield Road			Middlefield Road						Willow Road		
Base Volume Input [veh/h]	81	292	170	210	304	14	17	206	94	361	112	411
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	30	40	75	84	11	0	0	78	5	20	116	87
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	111	332	245	294	315	14	17	284	99	381	228	498
Peak Hour Factor	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	87	64	77	82	4	4	74	26	100	60	130
Total Analysis Volume [veh/h]	116	347	256	307	329	15	18	297	104	398	238	521
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	15			5			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			15			5		
v_co, Outbound Pedestrian Volume crossing	6			4			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			4			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	14			7			5			22		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	0	0	0	0	0	0	0	0	0	0	0
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	32	0	39	39	39	0	33	0	46	46	46
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	3	0	3	3	3	0	3	0	3	3	3
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	21	21	21	21	22	22	22	26	26	26	62	62	62
g / C, Green / Cycle	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.18	0.18	0.18	0.42	0.42	0.42
(v / s)_i Volume / Saturation Flow Rate	0.07	0.11	0.12	0.12	0.12	0.12	0.12	0.01	0.16	0.07	0.18	0.17	0.34
s, saturation flow rate [veh/h]	1781	1870	1721	1499	1781	1830	1840	1781	1870	1521	1781	1847	1552
c, Capacity [veh/h]	251	264	243	212	258	265	266	314	329	268	740	767	644
d1, Uniform Delay [s]	59.18	62.52	62.74	62.60	62.29	62.27	62.30	51.43	60.52	54.47	31.22	30.98	38.15
k, delay calibration	0.11	0.17	0.18	0.20	0.11	0.11	0.11	0.11	0.32	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.32	9.04	11.78	17.73	6.57	6.31	6.39	0.08	21.49	0.92	1.82	1.65	10.52
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.46	0.81	0.84	0.87	0.83	0.82	0.83	0.06	0.90	0.39	0.43	0.41	0.81
d, Delay for Lane Group [s/veh]	60.50	71.55	74.52	80.33	68.87	68.58	68.68	51.50	82.01	55.39	33.04	32.63	48.67
Lane Group LOS	E	E	E	F	E	E	E	D	F	E	C	C	D
Critical Lane Group	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	4.18	8.66	8.38	7.92	8.39	8.58	8.66	0.58	13.07	3.57	8.77	8.68	18.69
50th-Percentile Queue Length [ft/ln]	104.3	216.4	209.5	197.9	209.78	214.47	216.46	14.46	326.73	89.19	219.22	217.04	467.19
95th-Percentile Queue Length [veh/ln]	7.52	13.48	13.13	12.53	13.14	13.38	13.48	1.04	19.00	6.42	13.63	13.51	25.78
95th-Percentile Queue Length [ft/ln]	187.9	337.1	328.2	313.3	328.55	334.56	337.11	26.03	474.95	160.54	340.63	337.84	644.43

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	60.50	72.68	78.98	68.78	68.65	68.68	51.50	82.01	55.39	32.96	32.63	48.67
Movement LOS	E	E	E	E	E	E	D	F	E	C	C	D
d_A, Approach Delay [s/veh]	72.86			68.71			74.09			39.97		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	59.20											
Intersection LOS	E											
Intersection V/C	0.779											

Emissions

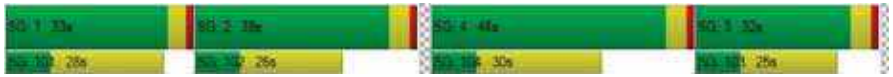
Vehicle Miles Traveled [mph]	2.75	5.10	4.82	4.38	73.41	75.23	75.86	7.51	123.84	43.37	135.18	135.18	221.47
Stops [stops/h]	100.2	207.8	201.1	190.0	201.39	205.89	207.80	13.88	313.66	85.62	210.45	208.36	448.51
Fuel consumption [US gal/h]	2.09	4.49	4.39	4.25	7.12	7.28	7.35	0.57	11.79	3.43	9.02	8.99	16.84
CO [g/h]	146.4	313.7	307.0	296.9	497.49	508.78	513.44	40.14	823.90	239.78	630.79	628.38	1177.05
NOx [g/h]	28.49	61.05	59.73	57.78	96.79	98.99	99.90	7.81	160.30	46.65	122.73	122.26	229.01
VOC [g/h]	33.94	72.72	71.15	68.83	115.30	117.91	118.99	9.30	190.95	55.57	146.19	145.63	272.79

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.48	63.48	63.48	63.48
I_p,int, Pedestrian LOS Score for Intersectio	4.313	2.623	2.347	2.814
Crosswalk LOS	E	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	457	383	551
d_b, Bicycle Delay [s]	50.54	44.78	49.17	39.82
I_b,int, Bicycle LOS Score for Intersection	2.978	2.097	2.251	3.469
Bicycle LOS	C	B	B	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	11.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.660

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	53	24	72	27	24	12	1	463	33	29	771	10
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	25	0	11	0	0	0	0	230	6	1	199	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	78	24	83	27	24	12	1	693	39	30	970	10
Peak Hour Factor	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	20	6	21	7	6	3	0	178	10	8	250	3
Total Analysis Volume [veh/h]	80	25	85	28	25	12	1	714	40	31	999	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			1			5		
v_di, Inbound Pedestrian Volume crossing m	5			1			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			6			0		
v_ci, Inbound Pedestrian Volume crossing mi	6			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			5			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	26	0	26	26	26	64	64	64	64	64	64
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	13	13	13	13	69	69	69	69
g / C, Green / Cycle	0.14	0.14	0.14	0.14	0.77	0.77	0.77	0.77
(v / s)_i Volume / Saturation Flow Rate	0.06	0.07	0.02	0.02	0.00	0.41	0.04	0.54
s, saturation flow rate [veh/h]	1367	1614	1275	1750	558	1850	709	1866
c, Capacity [veh/h]	214	230	148	250	349	1417	500	1430
d1, Uniform Delay [s]	38.88	35.50	41.22	33.80	12.14	4.15	7.84	5.35
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.08	1.54	0.61	0.27	0.01	1.43	0.24	2.95
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.37	0.48	0.19	0.15	0.00	0.53	0.06	0.71
d, Delay for Lane Group [s/veh]	39.96	37.04	41.83	34.07	12.15	5.58	8.08	8.30
Lane Group LOS	D	D	D	C	B	A	A	A
Critical Lane Group	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.75	2.31	0.63	0.73	0.01	4.64	0.28	8.20
50th-Percentile Queue Length [ft/ln]	43.82	57.82	15.65	18.20	0.29	115.96	6.95	205.06
95th-Percentile Queue Length [veh/ln]	3.16	4.16	1.13	1.31	0.02	8.17	0.50	12.90
95th-Percentile Queue Length [ft/ln]	78.88	104.08	28.17	32.76	0.53	204.26	12.52	322.49

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	39.96	37.04	37.04	41.83	34.07	34.07	12.15	5.58	5.58	8.08	8.30	8.30
Movement LOS	D	D	D	D	C	C	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	38.27			37.41			5.59			8.29		
Approach LOS	D			D			A			A		
d_I, Intersection Delay [s/veh]	11.00											
Intersection LOS	B											
Intersection V/C	0.660											

Emissions

Vehicle Miles Traveled [mph]	5.73	7.88	2.42	3.20	0.43	320.51	3.08	100.30
Stops [stops/h]	70.12	92.52	25.04	29.12	0.47	185.53	11.13	328.10
Fuel consumption [US gal/h]	1.18	1.54	0.44	0.51	0.02	15.98	0.23	7.47
CO [g/h]	82.28	107.52	30.99	35.81	1.64	1117.13	16.23	522.41
NOx [g/h]	16.01	20.92	6.03	6.97	0.32	217.35	3.16	101.64
VOC [g/h]	19.07	24.92	7.18	8.30	0.38	258.91	3.76	121.07

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
l_p,int, Pedestrian LOS Score for Intersectio	2.061	1.968	2.553	2.550
Crosswalk LOS	B	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	487	487	1331	1331
d_b, Bicycle Delay [s]	25.78	25.79	5.05	5.06
l_b,int, Bicycle LOS Score for Intersection	1.873	1.667	2.805	3.276
Bicycle LOS	A	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	9.3
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.682

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	4	1	3	86	4	28	10	545	5	3	774	57
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	241	0	0	200	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	1	3	86	4	28	10	786	5	3	974	57
Peak Hour Factor	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	0	1	22	1	7	3	199	1	1	246	14
Total Analysis Volume [veh/h]	4	1	3	87	4	28	10	794	5	3	984	58
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			10			1		
v_di, Inbound Pedestrian Volume crossing m	10			1			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			6			12		
v_ci, Inbound Pedestrian Volume crossing mi	12			6			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			6			5			7		

Generated with PTV VISTRO
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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	30.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	36	0	36	36	36	94	94	94	94	94	94
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	14	14	108	108	108	108
g / C, Green / Cycle	0.11	0.11	0.83	0.83	0.83	0.83
(v / s)_i Volume / Saturation Flow Rate	0.01	0.08	0.02	0.43	0.00	0.56
s, saturation flow rate [veh/h]	1589	1461	541	1868	680	1849
c, Capacity [veh/h]	217	209	367	1544	513	1528
d1, Uniform Delay [s]	51.69	55.75	11.95	3.41	6.98	4.48
k, delay calibration	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	2.43	0.14	1.24	0.02	2.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.04	0.57	0.03	0.52	0.01	0.68
d, Delay for Lane Group [s/veh]	51.76	58.18	12.09	4.66	7.00	6.96
Lane Group LOS	D	E	B	A	A	A
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.24	3.93	0.14	5.52	0.03	9.05
50th-Percentile Queue Length [ft/ln]	6.03	98.16	3.57	138.11	0.74	226.17
95th-Percentile Queue Length [veh/ln]	0.43	7.07	0.26	9.38	0.05	13.98
95th-Percentile Queue Length [ft/ln]	10.86	176.69	6.43	234.48	1.34	349.49

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	51.76	51.76	51.76	58.18	58.18	58.18	12.09	4.66	4.66	7.00	6.96	6.96
Movement LOS	D	D	D	E	E	E	B	A	A	A	A	A
d_A, Approach Delay [s/veh]	51.76			58.18			4.75			6.96		
Approach LOS	D			E			A			A		
d_I, Intersection Delay [s/veh]	9.31											
Intersection LOS	A											
Intersection V/C	0.682											

Emissions

Vehicle Miles Traveled [mph]	0.23	2.82	0.99	79.42	0.88	305.19
Stops [stops/h]	6.68	108.73	3.96	152.98	0.82	250.53
Fuel consumption [US gal/h]	0.12	2.13	0.08	4.92	0.04	15.42
CO [g/h]	8.39	148.58	5.91	343.61	3.15	1078.06
NOx [g/h]	1.63	28.91	1.15	66.85	0.61	209.75
VOC [g/h]	1.95	34.43	1.37	79.64	0.73	249.85

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	1.745	1.838	2.458	2.743
Crosswalk LOS	A	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	491	491	1383	1383
d_b, Bicycle Delay [s]	37.01	37.13	6.20	6.21
l_b,int, Bicycle LOS Score for Intersection	1.573	1.756	2.894	3.284
Bicycle LOS	A	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	49.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.936

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Generated with PTV VISTRO
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Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	73	6	69	54	3	16	15	903	7	30	877	52
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	13	0	8	4	237	0	0	192	4
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	73	6	69	67	3	24	19	1140	7	30	1069	56
Peak Hour Factor	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	2	18	17	1	6	5	294	2	8	275	14
Total Analysis Volume [veh/h]	75	6	71	69	3	25	20	1174	7	31	1101	58
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			18			4		
v_di, Inbound Pedestrian Volume crossing m	18			4			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			6			5		
v_ci, Inbound Pedestrian Volume crossing mi	5			6			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			12			4			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	143	143	143	143	143	143	143	143	143	143
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	14	14	8	8	8	3	98	98	5	100
g / C, Green / Cycle	0.10	0.10	0.06	0.06	0.06	0.02	0.68	0.68	0.03	0.70
(v / s)_i Volume / Saturation Flow Rate	0.08	0.07	0.03	0.03	0.02	0.02	0.36	0.36	0.03	0.76
s, saturation flow rate [veh/h]	937	1183	937	1359	1362	937	1422	1866	937	1529
c, Capacity [veh/h]	94	119	54	79	79	19	970	1272	32	1065
d1, Uniform Delay [s]	63.14	62.14	65.80	65.79	64.75	70.40	11.35	11.35	69.29	21.83
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.23	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	13.87	5.77	8.10	5.63	2.26	118.80	0.96	0.73	65.54	54.96
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.79	0.65	0.54	0.54	0.32	1.07	0.53	0.53	0.97	1.09
d, Delay for Lane Group [s/veh]	77.02	67.90	73.90	71.42	67.01	189.20	12.31	12.09	134.83	76.78
Lane Group LOS	E	E	E	E	E	F	B	B	F	F
Critical Lane Group	Yes	No	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.07	2.92	1.20	1.69	0.95	1.30	8.04	10.48	1.73	49.24
50th-Percentile Queue Length [ft/ln]	76.74	73.11	30.07	42.16	23.82	32.53	201.10	262.05	43.32	1230.89
95th-Percentile Queue Length [veh/ln]	5.53	5.26	2.17	3.04	1.72	2.34	12.70	15.79	3.12	65.54
95th-Percentile Queue Length [ft/ln]	138.13	131.60	54.13	75.88	42.88	58.55	317.39	394.79	77.98	1638.50

A359

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	77.02	67.90	67.90	72.48	71.42	67.01	189.20	12.18	12.09	134.83	76.78	76.78
Movement LOS	E	E	E	E	E	E	F	B	B	F	F	E
d_A, Approach Delay [s/veh]	72.40			71.03			15.13			78.29		
Approach LOS	E			E			B			E		
d_I, Intersection Delay [s/veh]	48.95											
Intersection LOS	D											
Intersection V/C	0.936											

Emissions

Vehicle Miles Traveled [mph]	3.58	3.67	1.13	1.63	0.96	5.86	149.58	196.33	3.99	149.16
Stops [stops/h]	77.03	73.38	30.18	42.32	23.91	32.65	201.86	263.03	43.48	1235.51
Fuel consumption [US gal/h]	1.63	1.51	0.53	0.74	0.41	1.19	8.55	11.18	1.20	29.55
CO [g/h]	114.06	105.59	37.03	52.01	28.93	83.28	597.78	781.77	83.64	2065.83
NOx [g/h]	22.19	20.54	7.20	10.12	5.63	16.20	116.31	152.10	16.27	401.94
VOC [g/h]	26.43	24.47	8.58	12.05	6.71	19.30	138.54	181.18	19.39	478.78

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	61.15	61.15	61.15	61.15
l_p,int, Pedestrian LOS Score for Intersectio	2.015	2.168	2.739	2.814
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	418	418	279	279
d_b, Bicycle Delay [s]	44.96	45.14	53.23	53.23
l_b,int, Bicycle LOS Score for Intersection	1.810	1.720	2.550	3.523
Bicycle LOS	A	A	B	D

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	76.4
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.080

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

A360

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	254	58	43	1173	1095	590
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	25	0	0	250	196	70
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	279	58	43	1423	1291	660
Peak Hour Factor	0.9360	0.9360	0.9360	0.9360	0.9360	0.9360
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	75	15	11	380	345	176
Total Analysis Volume [veh/h]	298	62	46	1520	1379	705
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	2		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		4		8	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	18	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	20	12	60	48	48
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	79	79	79	79	79	79
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	27	27	3	43	36	36
g / C, Green / Cycle	0.34	0.34	0.04	0.54	0.46	0.46
(v / s)_i Volume / Saturation Flow Rate	0.32	0.04	0.04	0.58	0.49	0.58
s, saturation flow rate [veh/h]	937	1589	1312	2623	2792	1222
c, Capacity [veh/h]	318	539	52	1412	1270	555
d1, Uniform Delay [s]	25.34	17.99	37.86	18.28	21.58	21.12
k, delay calibration	0.19	0.04	0.04	0.21	0.15	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	18.89	0.03	16.95	40.70	43.64	134.84
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.94	0.12	0.89	1.08	1.09	1.27
d, Delay for Lane Group [s/veh]	44.24	18.02	54.80	58.98	65.22	155.95
Lane Group LOS	D	B	D	F	F	F
Critical Lane Group	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.75	0.76	1.11	19.07	18.00	29.63
50th-Percentile Queue Length [ft/ln]	168.82	18.90	27.79	476.70	449.92	740.63
95th-Percentile Queue Length [veh/ln]	11.01	1.36	2.00	27.72	26.44	44.98
95th-Percentile Queue Length [ft/ln]	275.37	34.02	50.02	692.90	660.95	1124.46

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	44.24	18.02	54.80	58.98	65.22	155.95
Movement LOS	D	B	D	F	F	F
d_A, Approach Delay [s/veh]	39.72		58.86		95.91	
Approach LOS	D		E		F	
d_I, Intersection Delay [s/veh]	76.40					
Intersection LOS	E					
Intersection V/C	1.080					

Emissions

Vehicle Miles Traveled [mph]	216.96	45.14	5.92	195.62	161.85	82.74
Stops [stops/h]	307.52	34.43	50.62	1736.67	1639.12	1349.11
Fuel consumption [US gal/h]	13.31	2.28	1.04	35.89	36.80	35.67
CO [g/h]	930.58	159.08	72.44	2508.71	2572.10	2493.40
NOx [g/h]	181.06	30.95	14.09	488.10	500.44	485.13
VOC [g/h]	215.67	36.87	16.79	581.42	596.11	577.87

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	29.29	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.294	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	400	1379	1075
d_b, Bicycle Delay [s]	25.31	3.82	8.48
l_b,int, Bicycle LOS Score for Intersection	1.560	2.852	3.279
Bicycle LOS	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	117.7
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.901

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	250	0	240	0	853	574	0	1445	1040	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	217	0	8	0	246	29	0	258	179	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	467	0	248	0	1099	603	0	1703	1219	0	0	0
Peak Hour Factor	0.9611	1.0000	0.9611	1.0000	0.9611	0.9611	1.0000	0.9611	0.9611	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	121	0	65	0	286	157	0	443	317	0	0	0
Total Analysis Volume [veh/h]	486	0	258	0	1143	627	0	1772	1268	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	8			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			8			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			4			8			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	23	0	0	0	57	0	0	57	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	4	0	0	4	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				No			No				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	80	80	80	80	80	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
I2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	14	14	58	58	58	
g / C, Green / Cycle	0.18	0.18	0.72	0.72	0.72	
(v / s)_i Volume / Saturation Flow Rate	0.14	0.09	0.22	0.35	1.38	
s, saturation flow rate [veh/h]	3459	2776	5094	5094	918	
c, Capacity [veh/h]	621	498	3670	3670	662	
d1, Uniform Delay [s]	31.34	29.65	4.03	4.79	10.52	
k, delay calibration	0.11	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	2.21	0.84	0.22	0.46	417.79	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	0.78	0.52	0.31	0.48	1.92	
d, Delay for Lane Group [s/veh]	33.55	30.49	4.25	5.25	428.32	
Lane Group LOS	C	C	A	A	F	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	4.54	2.24	1.70	3.14	84.16	
50th-Percentile Queue Length [ft/ln]	113.46	56.05	42.39	78.57	2104.01	
95th-Percentile Queue Length [veh/ln]	8.03	4.04	3.05	5.66	142.09	
95th-Percentile Queue Length [ft/ln]	200.81	100.88	76.30	141.42	3552.30	

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	33.55	0.00	30.49	0.00	4.25	0.00	0.00	5.25	428.32	0.00	0.00	0.00
Movement LOS	C		C		A			A	F			
d_A, Approach Delay [s/veh]	32.49			2.78			181.71			0.00		
Approach LOS	C			A			F			A		
d_I, Intersection Delay [s/veh]	117.67											
Intersection LOS	F											
Intersection V/C	1.901											

Emissions

Vehicle Miles Traveled [mph]	11.52	6.12	134.15	177.63	127.11	
Stops [stops/h]	408.46	201.77	228.90	424.27	3787.21	
Fuel consumption [US gal/h]	6.05	2.97	7.78	11.55	136.65	
CO [g/h]	422.84	207.41	543.51	807.25	9552.18	
NOx [g/h]	82.27	40.36	105.75	157.06	1858.51	
VOC [g/h]	98.00	48.07	125.96	187.09	2213.81	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	31.51	0.00	31.51
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.032	0.000	1.419
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	475	1325	1325	0
d_b, Bicycle Delay [s]	23.26	4.57	4.57	40.00
l_b,int, Bicycle LOS Score for Intersection	1.560	2.188	3.232	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	44.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.746

Intersection Setup

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	497	0	617	0	0	0	0	749	354	0	1988	415
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	49	0	568	0	0	0	0	454	9	0	388	108
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	546	0	1185	0	0	0	0	1203	363	0	2376	523
Peak Hour Factor	0.9889	1.0000	0.9889	1.0000	1.0000	1.0000	1.0000	0.9889	0.9889	1.0000	0.9889	0.9889
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	138	0	300	0	0	0	0	304	92	0	601	132
Total Analysis Volume [veh/h]	552	0	1198	0	0	0	0	1217	367	0	2403	529
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	0	7	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	0	30	0	50	0	0	58	0
Amber [s]	3.0	0.0	3.0	0.0	0.0	3.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	0.0	1.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	0	0	5	0	0	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	0	10	0	0	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No					No		No			No	
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	0	10	0	0	20	0	50	0	0	50	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	0	5	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No			No		No			No	
Maximum Recall	No		No			No		No			No	
Pedestrian Recall	No		No			No		No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	R	C	C	R
C, Calculated Cycle Length [s]	80	80	80	80	80	80
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	16	26	16	46	56	46
g / C, Green / Cycle	0.20	0.33	0.20	0.58	0.70	0.58
(v / s)_i Volume / Saturation Flow Rate	0.20	0.43	0.00	0.24	0.47	0.33
s, saturation flow rate [veh/h]	2752	2813	1589	5094	5094	1589
c, Capacity [veh/h]	572	914	318	2929	3566	914
d1, Uniform Delay [s]	33.89	27.00	0.00	9.49	6.81	10.83
k, delay calibration	0.11	0.13	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.13	141.78	0.00	0.44	1.04	2.67
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.97	1.31	0.00	0.42	0.67	0.58
d, Delay for Lane Group [s/veh]	45.02	168.78	0.00	9.93	7.85	13.50
Lane Group LOS	D	F	A	A	A	B
Critical Lane Group	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	6.22	26.21	0.00	3.61	6.08	5.88
50th-Percentile Queue Length [ft/ln]	155.43	655.28	0.00	90.37	151.94	146.98
95th-Percentile Queue Length [veh/ln]	10.31	40.26	0.00	6.51	10.12	9.86
95th-Percentile Queue Length [ft/ln]	257.67	1006.44	0.00	162.67	253.01	246.39

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	45.02	0.00	168.78	0.00	0.00	0.00	0.00	9.93	0.00	0.00	7.85	13.50
Movement LOS	D		F			A		A			A	B
d_A, Approach Delay [s/veh]	129.74			0.00			7.65			8.87		
Approach LOS	F			A			A			A		
d_I, Intersection Delay [s/veh]	44.48											
Intersection LOS	D											
Intersection V/C	0.746											

Emissions

Vehicle Miles Traveled [mph]	23.17	50.28	0.00	122.00	141.02	31.04
Stops [stops/h]	559.56	2359.02	0.00	488.02	820.46	264.56
Fuel consumption [US gal/h]	9.10	56.24	0.00	10.18	14.18	4.19
CO [g/h]	636.25	3931.47	0.00	711.43	991.05	293.08
NOx [g/h]	123.79	764.92	0.00	138.42	192.82	57.02
VOC [g/h]	147.46	911.16	0.00	164.88	229.68	67.92

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0			9.0			0.0			0.0		
M_corner, Corner Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	31.51			31.51			0.00			0.00		
l_p,int, Pedestrian LOS Score for Intersectio	2.637			1.968			0.000			0.000		
Crosswalk LOS	B			A			F			F		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	400			400			1150			1400		
d_b, Bicycle Delay [s]	25.60			25.60			7.23			3.60		
l_b,int, Bicycle LOS Score for Intersection	1.560			1.560			2.229			3.172		
Bicycle LOS	A			A			B			C		

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.PM.vistro
Report File: C:\...\NP PM.pdf

Scenario 27 Near-Term Plus Project PM
2/4/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road/101 NB Ramps	Signalized	HCM 7th Edition	WB Left	0.882	21.7	C
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	EB Left	0.880	24.6	C
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	NB Left	0.744	20.4	C
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	NB Left	0.659	30.8	C
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	SB Left	0.549	20.6	C
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	EB Thru	0.706	64.7	E
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	NB Left	0.802	37.9	D
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	NB Left	0.700	31.9	C
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	NB Left	0.562	27.6	C
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	EB Thru	0.780	57.9	E
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	WB Left	0.807	19.6	B
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.830	15.6	B
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	EB Left	0.752	19.0	B
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	EB Left	0.935	19.7	B
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	1.336	63.3	E
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	0.920	173.3	F

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V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road/101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	21.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.882

Intersection Setup

Name	Marsh Road (SR 84)		Marsh Road		101 NB Ramps	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

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Volumes

Name	Marsh Road (SR 84)		Marsh Road		101 NB Ramps	
Base Volume Input [veh/h]	1819	0	0	818	604	181
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	331	0	0	396	0	121
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2150	0	0	1214	604	302
Peak Hour Factor	0.9490	1.0000	1.0000	0.9490	0.9490	0.9490
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	566	0	0	320	159	80
Total Analysis Volume [veh/h]	2266	0	0	1279	636	318
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		3		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		3	
v_co, Outbound Pedestrian Volume crossing	5		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		5	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		2		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	100	0	0	100	100	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	70	0	0	70	30	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	Yes	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	68	68	28	28
g / C, Green / Cycle	0.68	0.68	0.28	0.28
(v / s)_i Volume / Saturation Flow Rate	0.64	0.36	0.18	0.11
s, saturation flow rate [veh/h]	3560	3560	3459	2798
c, Capacity [veh/h]	2403	2403	968	784
d1, Uniform Delay [s]	14.53	8.24	31.76	29.22
k, delay calibration	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.12	0.85	3.48	1.56
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.94	0.53	0.66	0.41
d, Delay for Lane Group [s/veh]	23.65	9.09	35.24	30.78
Lane Group LOS	C	A	D	C
Critical Lane Group	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	22.19	6.41	7.14	3.24
50th-Percentile Queue Length [ft/ln]	554.78	160.37	178.43	80.95
95th-Percentile Queue Length [veh/ln]	29.92	10.57	11.52	5.83
95th-Percentile Queue Length [ft/ln]	747.92	264.21	287.96	145.71

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	23.65	0.00	0.00	9.09	35.24	30.78
Movement LOS	C			A	D	C
d_A, Approach Delay [s/veh]	23.65		9.09		33.75	
Approach LOS	C		A		C	
d_I, Intersection Delay [s/veh]	21.65					
Intersection LOS	C					
Intersection V/C	0.882					

Emissions

Vehicle Miles Traveled [mph]	200.91	30.24	15.08	7.54
Stops [stops/h]	1597.76	461.85	513.87	233.14
Fuel consumption [US gal/h]	28.00	6.16	8.02	3.59
CO [g/h]	1957.49	430.78	560.62	250.97
NOx [g/h]	380.86	83.81	109.08	48.83
VOC [g/h]	453.67	99.84	129.93	58.16

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	41.41	39.61
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.079	2.368
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1308	1308	516
d_b, Bicycle Delay [s]	5.99	5.99	27.53
l_b,int, Bicycle LOS Score for Intersection	3.429	2.615	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	24.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.880

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

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Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	821	1056	279	1267	537
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	218	265	0	216	31
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1039	1321	279	1483	568
Peak Hour Factor	1.0000	0.9770	0.9770	1.0000	0.9770	0.9770
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	266	338	70	379	145
Total Analysis Volume [veh/h]	0	1063	1352	279	1518	581
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		1	
v_co, Outbound Pedestrian Volume crossing	0		6		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		6	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		4		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	100	100	0	100	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	12	16	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	40	40	0	60	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	49	47	46	46
g / C, Green / Cycle	0.49	0.47	0.46	0.46
(v / s)_i Volume / Saturation Flow Rate	0.27	0.38	0.44	0.37
s, saturation flow rate [veh/h]	4000	3560	3459	1588
c, Capacity [veh/h]	1972	1680	1598	734
d1, Uniform Delay [s]	17.51	22.48	25.78	22.80
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.06	4.21	1.59	0.74
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.54	0.80	0.95	0.79
d, Delay for Lane Group [s/veh]	18.57	26.69	27.38	23.54
Lane Group LOS	B	C	C	C
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	8.40	13.58	16.67	11.20
50th-Percentile Queue Length [ft/ln]	209.93	339.40	416.72	279.88
95th-Percentile Queue Length [veh/ln]	13.15	19.62	23.36	16.68
95th-Percentile Queue Length [ft/ln]	328.74	490.47	584.11	417.07

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	18.57	26.69	0.00	27.38	23.54
Movement LOS		B	C		C	C
d_A, Approach Delay [s/veh]	18.57		26.69		26.31	
Approach LOS	B		C		C	
d_I, Intersection Delay [s/veh]	24.60					
Intersection LOS	C					
Intersection V/C	0.880					

Emissions

Vehicle Miles Traveled [mph]	133.77	109.62	35.90	13.74
Stops [stops/h]	604.59	977.48	1200.16	403.03
Fuel consumption [US gal/h]	12.87	18.87	16.57	5.58
CO [g/h]	899.28	1319.30	1157.93	389.74
NOx [g/h]	174.97	256.69	225.29	75.83
VOC [g/h]	208.42	305.76	268.36	90.33

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	41.41	0.00	39.61
l_p,int, Pedestrian LOS Score for Intersectio	2.891	0.000	2.627
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	708	708	1118
d_b, Bicycle Delay [s]	20.87	20.91	9.72
l_b,int, Bicycle LOS Score for Intersection	2.437	2.675	1.560
Bicycle LOS	B	B	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	20.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.744

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	1	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Base Volume Input [veh/h]	32	1197	2	52	1246	295	248	4	2	12	5	142
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	218	0	0	296	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	32	1415	2	52	1542	295	248	4	2	12	5	142
Peak Hour Factor	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	361	1	13	394	75	63	1	1	3	1	36
Total Analysis Volume [veh/h]	33	1445	2	53	1575	301	253	4	2	12	5	145
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	8			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			8			0		
v_co, Outbound Pedestrian Volume crossing	1			0			1			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			1			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	0	1	6	0	0	4	0	0	3	0
Auxiliary Signal Groups												
Maximum Green [s]	15	40	0	10	40	0	0	20	0	0	20	0
Amber [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	7	0	0	8	0	0	8	0
Pedestrian Clearance [s]	0	21	0	0	21	0	0	24	0	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	57	0	20	62	0	0	32	0	0	36	0
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	4	10	0	0	4	0	0	6	0
Vehicle Extension [s]	2.5	3.5	0.0	2.0	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	5	102	102	6	102	102	18	18	12	12
g / C, Green / Cycle	0.04	0.70	0.70	0.04	0.70	0.70	0.12	0.12	0.08	0.08
(v / s)_i Volume / Saturation Flow Rate	0.02	0.27	0.27	0.02	0.50	0.53	0.07	0.07	0.01	0.05
s, saturation flow rate [veh/h]	1781	3560	1869	3459	1870	1769	1781	1780	1806	2813
c, Capacity [veh/h]	67	2498	1311	137	1316	1245	217	217	148	230
d1, Uniform Delay [s]	68.43	8.80	8.80	67.90	12.77	13.52	60.30	60.30	61.72	64.46
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.13	0.44	0.84	0.66	3.32	4.24	1.95	1.95	0.25	2.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.49	0.38	0.38	0.39	0.71	0.75	0.60	0.60	0.12	0.63
d, Delay for Lane Group [s/veh]	72.56	9.24	9.64	68.56	16.09	17.76	62.25	62.25	61.98	66.58
Lane Group LOS	E	A	A	E	B	B	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	1.28	5.90	6.34	0.97	17.81	19.00	4.69	4.69	0.60	2.69
50th-Percentile Queue Length [ft/ln]	31.89	147.55	158.50	24.25	445.36	475.11	117.19	117.16	14.99	67.31
95th-Percentile Queue Length [veh/ln]	2.30	9.89	10.47	1.75	24.74	26.15	8.24	8.24	1.08	4.85
95th-Percentile Queue Length [ft/ln]	57.40	247.15	261.73	43.65	618.41	653.85	205.96	205.91	26.99	121.16

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	72.56	9.37	9.64	68.56	16.77	17.76	62.25	62.25	62.25	61.98	61.98	66.58
Movement LOS	E	A	A	E	B	B	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	10.78			18.34			62.25			66.10		
Approach LOS	B			B			E			E		
d_I, Intersection Delay [s/veh]	20.41											
Intersection LOS	C											
Intersection V/C	0.744											

Emissions

Vehicle Miles Traveled [mph]	6.76	194.33	101.99	6.67	118.16	117.92	3.91	3.90	1.16	9.86
Stops [stops/h]	31.67	293.06	157.40	48.17	442.29	471.83	116.38	116.35	14.89	133.69
Fuel consumption [US gal/h]	0.98	11.40	6.05	1.36	10.91	11.43	2.26	2.26	0.32	2.92
CO [g/h]	68.71	796.54	422.76	94.77	762.27	798.96	158.16	158.11	22.61	204.16
NOx [g/h]	13.37	154.98	82.25	18.44	148.31	155.45	30.77	30.76	4.40	39.72
VOC [g/h]	15.92	184.61	97.98	21.96	176.66	185.17	36.65	36.64	5.24	47.31

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	61.00	61.00	61.92	61.92
l_p,int, Pedestrian LOS Score for Intersectio	3.057	3.229	2.125	2.359
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	717	786	383	439
d_b, Bicycle Delay [s]	29.82	26.70	47.36	44.19
l_b,int, Bicycle LOS Score for Intersection	2.374	3.151	1.987	1.827
Bicycle LOS	B	C	A	A

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	30.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.659

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Base Volume Input [veh/h]	182	683	24	3	798	492	476	17	131	42	21	22
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	218	0	0	296	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	182	901	24	3	1094	492	476	17	131	42	21	22
Peak Hour Factor	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	47	232	6	1	281	126	122	4	34	11	5	6
Total Analysis Volume [veh/h]	187	926	25	3	1124	506	489	17	135	43	22	23
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	15			6			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			15			6		
v_co, Outbound Pedestrian Volume crossing	3			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			3		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			1			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	31.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	50	50	50	0	50	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	22	45	45	22	45	45	37	36	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall		Yes		No	Yes			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	140	140	140	140	140	140	140	140	140	140	140
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	90	90	90	2	91	91	27	27	27	13	13
g / C, Green / Cycle	0.64	0.64	0.64	0.02	0.65	0.65	0.19	0.19	0.19	0.09	0.09
(v / s)_i Volume / Saturation Flow Rate	0.55	0.26	0.26	0.00	0.45	0.47	0.14	0.14	0.09	0.02	0.03
s, saturation flow rate [veh/h]	342	1870	1850	1781	1870	1678	1781	1787	1532	1781	1696
c, Capacity [veh/h]	195	1202	1189	32	1208	1084	340	342	293	162	154
d1, Uniform Delay [s]	65.37	12.00	12.01	67.63	15.92	16.61	53.37	53.37	50.05	59.26	59.41
k, delay calibration	0.50	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	53.97	0.98	1.00	0.47	3.31	4.34	2.39	2.38	0.84	0.64	0.77
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.96	0.40	0.40	0.09	0.69	0.73	0.74	0.74	0.46	0.27	0.29
d, Delay for Lane Group [s/veh]	119.33	12.98	13.00	68.10	19.24	20.94	55.76	55.75	50.89	59.90	60.17
Lane Group LOS	F	B	B	E	B	C	E	E	D	E	E
Critical Lane Group	No	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	5.33	7.23	7.17	0.11	17.30	17.22	8.70	8.73	4.32	1.47	1.54
50th-Percentile Queue Length [ft/ln]	133.23	180.77	179.35	2.74	432.57	430.55	217.61	218.20	107.93	36.75	38.61
95th-Percentile Queue Length [veh/ln]	9.12	11.64	11.57	0.20	24.12	24.03	13.54	13.57	7.72	2.65	2.78
95th-Percentile Queue Length [ft/ln]	227.88	291.02	289.16	4.93	603.12	600.70	338.57	339.33	193.11	66.14	69.50

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	119.33	12.99	13.00	68.10	19.67	20.94	55.75	55.75	50.89	59.90	60.17	60.17
Movement LOS	F	B	B	E	B	C	E	E	D	E	E	E
d_A, Approach Delay [s/veh]	30.47			20.15			54.73			60.04		
Approach LOS	C			C			D			E		
d_I, Intersection Delay [s/veh]	30.84											
Intersection LOS	C											
Intersection V/C	0.659											

Emissions

Vehicle Miles Traveled [mph]	29.71	75.89	75.21	0.61	171.84	161.97	29.24	29.33	15.63	2.37	2.48
Stops [stops/h]	137.04	185.94	184.47	2.82	444.93	442.86	223.82	224.44	111.01	37.80	39.72
Fuel consumption [US gal/h]	6.70	5.55	5.51	0.09	13.18	12.88	5.04	5.05	2.53	0.78	0.81
CO [g/h]	468.56	388.17	384.93	6.02	921.34	899.96	352.29	353.26	176.60	54.22	56.96
NOx [g/h]	91.16	75.52	74.89	1.17	179.26	175.10	68.54	68.73	34.36	10.55	11.08
VOC [g/h]	108.59	89.96	89.21	1.40	213.53	208.58	81.65	81.87	40.93	12.57	13.20

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.43	59.43	59.43	59.43
l_p,int, Pedestrian LOS Score for Intersectio	2.937	3.114	2.625	1.997
Crosswalk LOS	C	C	B	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	577	577	457	469
d_b, Bicycle Delay [s]	35.45	35.43	41.68	41.04
l_b,int, Bicycle LOS Score for Intersection	2.498	2.907	2.617	1.705
Bicycle LOS	B	C	B	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	20.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.549

Intersection Setup

Name				Marsh Road			Bay Road					
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			No		

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Version 2024 (SP 0-6) 2/4/2026

Volumes

Name				Marsh Road			Bay Road					
Base Volume Input [veh/h]	3	697	68	156	755	71	71	34	6	63	21	117
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	211	0	11	285	0	0	0	0	0	0	7
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	908	68	167	1040	71	71	34	6	63	21	124
Peak Hour Factor	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	241	18	44	276	19	19	9	2	17	6	33
Total Analysis Volume [veh/h]	3	964	72	177	1104	75	75	36	6	67	22	132
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			13			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			13		
v_co, Outbound Pedestrian Volume crossing	0			2			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			2			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			4			0			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	4.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	0	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	17	0	0	0	17	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	105	70	105	35	105	70	45	45	45	0	45	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Version 2024 (SP 0-6) 2/4/2026

Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
I2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	96	96	19	118	118	28	28
g / C, Green / Cycle	0.64	0.64	0.13	0.78	0.78	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.30	0.30	0.10	0.32	0.32	0.11	0.14
s, saturation flow rate [veh/h]	1863	1653	1781	1870	1822	1020	1586
c, Capacity [veh/h]	1213	1054	225	1467	1429	228	325
d1, Uniform Delay [s]	13.93	13.97	63.54	5.12	5.13	56.62	57.66
k, delay calibration	0.50	0.50	0.11	0.50	0.50	0.23	0.24
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.22	1.47	5.97	0.84	0.87	3.78	5.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.45	0.46	0.79	0.41	0.41	0.51	0.68
d, Delay for Lane Group [s/veh]	15.15	15.44	69.51	5.95	6.00	60.40	63.14
Lane Group LOS	B	B	E	A	A	E	E
Critical Lane Group	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	9.90	8.90	6.92	5.46	5.38	4.44	8.45
50th-Percentile Queue Length [ft/ln]	247.50	222.54	172.91	136.46	134.57	110.98	211.28
95th-Percentile Queue Length [veh/ln]	15.06	13.79	11.23	9.29	9.19	7.89	13.22
95th-Percentile Queue Length [ft/ln]	376.51	344.87	280.74	232.25	229.69	197.37	330.47

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	15.15	15.28	15.44	69.51	5.97	6.00	60.40	60.40	60.40	63.14	63.14	63.14
Movement LOS	B	B	B	E	A	A	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	15.29			14.27			60.40			63.14		
Approach LOS	B			B			E			E		
d_I, Intersection Delay [s/veh]	20.58											
Intersection LOS	C											
Intersection V/C	0.549											

Emissions

Vehicle Miles Traveled [mph]	350.27	311.80	28.12	94.55	92.78	9.09	359.68
Stops [stops/h]	237.60	213.64	165.99	131.00	129.18	106.54	202.83
Fuel consumption [US gal/h]	17.43	15.55	4.82	5.31	5.22	2.26	18.77
CO [g/h]	1218.16	1087.19	337.18	371.17	364.94	157.67	1311.77
NOx [g/h]	237.01	211.53	65.60	72.22	71.00	30.68	255.22
VOC [g/h]	282.32	251.97	78.14	86.02	84.58	36.54	304.02

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	99.9	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	64.40	8.37	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.006	1.750	0.000
Crosswalk LOS	F	C	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	865	1332	537	537
d_b, Bicycle Delay [s]	24.16	8.38	40.11	40.11
l_b,int, Bicycle LOS Score for Intersection	2.417	2.678	1.753	1.924
Bicycle LOS	B	B	A	A

Sequence

Ring 1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	64.7
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.706

Intersection Setup

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	149	99	21	40	97	23	100	525	60	20	351	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	86	0	5	0	0	1	1	66	100	58	120	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	235	99	26	40	97	24	101	591	160	78	471	9
Peak Hour Factor	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	63	27	7	11	26	6	27	158	43	21	126	2
Total Analysis Volume [veh/h]	252	106	28	43	104	26	108	633	171	84	504	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			10			11		
v_di, Inbound Pedestrian Volume crossing m	11			10			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			12			12		
v_ci, Inbound Pedestrian Volume crossing mi	12			12			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	7			8			6			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	180
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	35	35	35	35	35	35	30	60	60	30	30	30
Amber [s]	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	46	40	46	40	46	13	84	84	10	81	81
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	4	4	4	4	4
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	180	180	180	180	180	180	180	180
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	0.00	2.10	0.00	2.00
g_i, Effective Green Time [s]	42	42	36	36	90	80	90	77
g / C, Green / Cycle	0.23	0.23	0.20	0.20	0.50	0.44	0.50	0.43
(v / s)_i Volume / Saturation Flow Rate	0.14	0.08	0.02	0.07	0.11	0.45	0.11	0.28
s, saturation flow rate [veh/h]	1781	1779	1781	1791	992	1785	775	1862
c, Capacity [veh/h]	415	414	355	357	362	792	160	800
d1, Uniform Delay [s]	61.71	57.29	59.11	62.19	29.18	50.05	41.96	40.43
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.50	0.19	0.21
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.49	2.06	0.70	2.85	0.45	35.55	4.72	1.70
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.32	0.12	0.36	0.30	1.01	0.53	0.64
d, Delay for Lane Group [s/veh]	68.20	59.36	59.80	65.05	29.64	85.60	46.68	42.13
Lane Group LOS	E	E	E	E	C	F	D	D
Critical Lane Group	Yes	No	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	11.16	5.38	1.72	5.52	2.61	43.34	2.18	18.56
50th-Percentile Queue Length [ft/ln]	279.03	134.46	42.88	138.03	65.27	1083.43	54.41	464.08
95th-Percentile Queue Length [veh/ln]	16.64	9.18	3.09	9.38	4.70	54.78	3.92	25.63
95th-Percentile Queue Length [ft/ln]	416.01	229.55	77.19	234.38	117.49	1369.42	97.95	640.73

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	68.20	59.36	59.36	59.80	65.05	65.05	29.64	85.60	85.60	46.68	42.13	42.13
Movement LOS	E	E	E	E	E	E	C	F	F	D	D	D
d_A, Approach Delay [s/veh]	65.13			63.74			78.97			42.77		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	64.65											
Intersection LOS	E											
Intersection V/C	0.706											

Emissions

Vehicle Miles Traveled [mph]	145.25	77.24	1.02	3.08	25.63	190.83	14.82	90.66
Stops [stops/h]	223.23	107.57	34.31	110.43	52.22	866.74	43.53	371.26
Fuel consumption [US gal/h]	10.71	5.39	0.70	2.28	2.00	26.65	1.65	10.19
CO [g/h]	748.61	376.92	48.98	159.57	139.45	1862.62	115.21	712.23
NOx [g/h]	145.65	73.33	9.53	31.05	27.13	362.40	22.42	138.57
VOC [g/h]	173.50	87.35	11.35	36.98	32.32	431.68	26.70	165.07

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	79.34	79.34	79.34	79.34
l_p,int, Pedestrian LOS Score for Intersectio	2.269	2.148	2.577	2.396
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	460	393	881	848
d_b, Bicycle Delay [s]	53.55	58.31	28.25	30.04
l_b,int, Bicycle LOS Score for Intersection	2.197	1.845	3.064	2.546
Bicycle LOS	B	A	C	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



A383

Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	37.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.802

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

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Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	97	1274	513	140	863	55	54	274	73	312	175	59
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	20	42	98	60	65	106	52	9	12	90	47	70
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	117	1316	611	200	928	161	106	283	85	402	222	129
Peak Hour Factor	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	30	335	155	51	236	41	27	72	22	102	56	33
Total Analysis Volume [veh/h]	119	1339	622	203	944	164	108	288	86	409	226	131
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			12		
v_di, Inbound Pedestrian Volume crossing m	0			12			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			48			64		
v_ci, Inbound Pedestrian Volume crossing mi	64			48			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			11			14		

Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.2	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.20	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	1.20	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	14	67	67	20	74	74	23	23	26	26	26
g / C, Green / Cycle	0.09	0.45	0.45	0.14	0.49	0.49	0.16	0.16	0.17	0.17	0.17
(v / s)_i Volume / Saturation Flow Rate	0.07	0.38	0.41	0.11	0.27	0.11	0.13	0.14	0.12	0.12	0.09
s, saturation flow rate [veh/h]	1781	3560	1522	1781	3560	1481	1830	1738	3459	1870	1510
c, Capacity [veh/h]	162	1599	683	244	1758	731	285	270	592	320	259
d1, Uniform Delay [s]	64.18	25.70	26.47	56.26	7.85	7.02	61.74	61.94	58.41	58.59	56.13
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.43	5.41	18.40	2.85	1.18	0.71	2.97	3.61	0.54	1.07	0.57
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.74	0.84	0.91	0.83	0.54	0.22	0.86	0.88	0.69	0.71	0.51
d, Delay for Lane Group [s/veh]	66.61	31.11	44.87	59.11	9.03	7.74	64.70	65.55	58.96	59.66	56.70
Lane Group LOS	E	C	D	E	A	A	E	E	E	E	E
Critical Lane Group	No	No	Yes	Yes	No	No	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.39	18.06	19.82	6.96	3.54	1.21	9.36	9.15	7.39	8.23	4.56
50th-Percentile Queue Length [ft/ln]	109.70	451.41	495.42	173.95	88.62	30.24	233.91	228.76	184.65	205.82	114.01
95th-Percentile Queue Length [veh/ln]	7.82	25.03	27.12	11.28	6.38	2.18	14.37	14.11	11.84	12.94	8.06
95th-Percentile Queue Length [ft/ln]	195.59	625.63	677.94	282.10	159.52	54.43	359.32	352.79	296.08	323.46	201.56

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	66.61	31.11	44.87	59.11	9.03	7.74	64.70	65.15	65.55	58.96	59.66	56.70
Movement LOS	E	C	D	E	A	A	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	37.25			16.62			65.12			58.78		
Approach LOS	D			B			E			E		
d_I, Intersection Delay [s/veh]	37.87											
Intersection LOS	D											
Intersection V/C	0.802											

Emissions

Vehicle Miles Traveled [mph]	2.82	31.75	14.75	4.81	22.38	3.89	5.79	5.62	97.08	53.64	31.09
Stops [stops/h]	105.32	866.71	475.61	166.99	170.15	29.03	224.55	219.61	354.53	197.59	109.45
Fuel consumption [US gal/h]	2.51	16.20	9.82	3.88	3.87	0.62	4.70	4.61	10.86	6.04	3.40
CO [g/h]	175.63	1132.66	686.28	271.29	270.36	43.67	328.52	322.27	759.21	422.42	237.39
NOx [g/h]	34.17	220.37	133.53	52.78	52.60	8.50	63.92	62.70	147.71	82.19	46.19
VOC [g/h]	40.70	262.50	159.05	62.87	62.66	10.12	76.14	74.69	175.95	97.90	55.02

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.026	2.285	2.781
Crosswalk LOS	F	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.52	25.30	54.06	52.45
l_b,int, Bicycle LOS Score for Intersection	3.276	2.641	1.957	2.824
Bicycle LOS	C	B	A	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	31.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.700

Intersection Setup

Name	Middlefield Road				Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Middlefield Road				Ravenswood Avenue	
Base Volume Input [veh/h]	297	584	333	66	157	493
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	30	147	63	37	94	36
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	327	731	396	103	251	529
Peak Hour Factor	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	84	188	102	27	65	136
Total Analysis Volume [veh/h]	337	753	408	106	259	545
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		2	
v_di, Inbound Pedestrian Volume crossing m	2		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		12	
v_ci, Inbound Pedestrian Volume crossing mi	0		12		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	2		2		3	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	34	35	70	0	35	34
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	18	18	0	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
l2, Clearance Lost Time [s]	2.5	6.1	0.0	0.0	0.0	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	38	91	53	0	39	38
Lead / Lag	Lag	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	2.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	Yes	Yes		No	No
Pedestrian Recall	No	No	No		Yes	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.50	8.10	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.50	6.10	0.00	0.00	0.00
g_i, Effective Green Time [s]	27	85	59	35	67
g / C, Green / Cycle	0.21	0.65	0.45	0.27	0.52
(v / s)_i Volume / Saturation Flow Rate	0.19	0.40	0.29	0.15	0.35
s, saturation flow rate [veh/h]	1781	1870	1789	1781	1578
c, Capacity [veh/h]	377	1219	810	482	785
d1, Uniform Delay [s]	49.84	13.20	27.33	40.47	24.98
k, delay calibration	0.25	0.50	0.50	0.08	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	15.42	2.36	3.78	0.73	5.01
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.89	0.62	0.63	0.54	0.69
d, Delay for Lane Group [s/veh]	65.26	15.55	31.11	41.20	30.00
Lane Group LOS	E	B	C	D	C
Critical Lane Group	No	No	Yes	Yes	Yes
50th-Percentile Queue Length [veh/ln]	12.16	12.71	13.01	7.21	13.77
50th-Percentile Queue Length [ft/ln]	303.90	317.69	325.32	180.30	344.21
95th-Percentile Queue Length [veh/ln]	17.87	18.55	18.93	11.62	19.85
95th-Percentile Queue Length [ft/ln]	446.85	463.85	473.22	290.40	496.35

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	65.26	15.55	31.11	31.11	41.20	30.00
Movement LOS	E	B	C	C	D	C
d_A, Approach Delay [s/veh]	30.92		31.11		33.61	
Approach LOS	C		C		C	
d_I, Intersection Delay [s/veh]	31.86					
Intersection LOS	C					
Intersection V/C	0.700					

Emissions

Vehicle Miles Traveled [mph]	27.95	62.45	549.01	54.27	114.19
Stops [stops/h]	336.63	351.91	360.35	199.72	381.28
Fuel consumption [US gal/h]	8.07	7.41	27.84	5.51	10.13
CO [g/h]	564.23	517.95	1946.36	385.07	708.40
NOx [g/h]	109.78	100.77	378.69	74.92	137.83
VOC [g/h]	130.77	120.04	451.09	89.24	164.18

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.730	0.000	2.363
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1331	746	531
d_b, Bicycle Delay [s]	7.29	25.57	35.13
l_b,int, Bicycle LOS Score for Intersection	3.358	2.408	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	27.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.562

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street					
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	2	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/4/2026

Volumes

Name	Middlefield Road			Middlefield Road			D Street					
Base Volume Input [veh/h]	1	667	125	319	507	1	19	17	9	68	1	190
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	148	1	5	92	2	24	72	0	1	5	5
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	1	815	126	324	599	3	43	89	9	69	6	195
Peak Hour Factor	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	207	32	82	152	1	11	23	2	18	2	49
Total Analysis Volume [veh/h]	1	827	128	329	608	3	44	90	9	70	6	198
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			1			0		
v_co, Outbound Pedestrian Volume crossing	5			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	11			2			0			8		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	10	35	35	10	50	0	35	35	35	50	35	50
Amber [s]	3.5	3.5	3.5	3.5	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.5	6.1	0.0	0.0	0.0	0.0	6.1	0.0	6.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	10	53	38	39	82	0	53	38	53	82	38	82
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	2.0	3.0	3.0	3.0	2.5	0.0	3.0	3.0	3.0	2.5	3.0	2.5
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	No			No			No	
Pedestrian Recall	No	No		Yes	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	130	130	130	130	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.50	8.10	8.10	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.50	6.10	6.10	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	3	70	70	28	89	89	26	26	26	26
g / C, Green / Cycle	0.02	0.54	0.54	0.21	0.69	0.69	0.20	0.20	0.20	0.20
(v / s)_i Volume / Saturation Flow Rate	0.00	0.23	0.08	0.18	0.16	0.16	0.04	0.05	0.08	0.13
s, saturation flow rate [veh/h]	1781	3560	1538	1781	1870	1866	1178	1840	948	1556
c, Capacity [veh/h]	37	1912	826	380	1284	1282	148	367	242	311
d1, Uniform Delay [s]	62.39	18.15	15.15	49.34	7.63	7.63	57.31	44.01	50.44	47.56
k, delay calibration	0.04	0.50	0.50	0.25	0.50	0.50	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.11	0.72	0.40	12.82	0.44	0.44	1.11	0.39	0.73	2.17
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.03	0.43	0.15	0.87	0.24	0.24	0.30	0.27	0.31	0.64
d, Delay for Lane Group [s/veh]	62.50	18.86	15.55	62.16	8.06	8.07	58.42	44.40	51.17	49.73
Lane Group LOS	E	B	B	E	A	A	E	D	D	D
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.03	7.53	1.99	11.56	3.16	3.15	1.45	2.81	2.31	6.07
50th-Percentile Queue Length [ft/ln]	0.83	188.13	49.69	289.03	78.96	78.84	36.36	70.20	57.79	151.74
95th-Percentile Queue Length [veh/ln]	0.06	12.02	3.58	17.14	5.69	5.68	2.62	5.05	4.16	10.11
95th-Percentile Queue Length [ft/ln]	1.50	300.60	89.43	428.43	142.14	141.91	65.45	126.37	104.02	252.74

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	62.50	18.86	15.55	62.16	8.07	8.07	58.42	44.40	44.40	51.17	51.17	49.73
Movement LOS	E	B	B	E	A	A	E	D	D	D	D	D
d_A, Approach Delay [s/veh]		18.47			27.00			48.71			50.13	
Approach LOS		B			C			D			D	
d_I, Intersection Delay [s/veh]	27.55											
Intersection LOS	C											
Intersection V/C	0.562											

Emissions

Vehicle Miles Traveled [mph]	0.16	131.19	20.31	27.28	25.36	25.31	2.97	6.68	63.89	166.46
Stops [stops/h]	0.92	416.78	55.04	320.15	87.47	87.33	40.28	77.76	64.01	168.08
Fuel consumption [US gal/h]	0.03	11.31	1.59	7.61	2.13	2.12	0.77	1.42	3.78	9.78
CO [g/h]	1.80	790.54	111.35	531.85	148.62	148.38	53.75	98.99	263.88	683.96
NOx [g/h]	0.35	153.81	21.66	103.48	28.92	28.87	10.46	19.26	51.34	133.07
VOC [g/h]	0.42	183.22	25.81	123.26	34.45	34.39	12.46	22.94	61.16	158.51

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	3.076	2.837	1.991	2.225
Crosswalk LOS	C	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	746	1192	515	515
d_b, Bicycle Delay [s]	25.69	10.61	35.82	35.96
l_b,int, Bicycle LOS Score for Intersection	2.348	2.335	1.796	2.012
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	57.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.780

Intersection Setup

Name	Middlefield Road			Middlefield Road						Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road						Willow Road		
Base Volume Input [veh/h]	71	376	294	195	304	3	31	230	156	353	63	304
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	3	18	36	98	39	0	0	124	34	112	88	95
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	74	394	330	293	343	3	31	354	190	465	151	399
Peak Hour Factor	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	103	86	76	90	1	8	92	50	121	39	104
Total Analysis Volume [veh/h]	77	411	344	306	358	3	32	369	198	485	158	416
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	8			5			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			8			5		
v_co, Outbound Pedestrian Volume crossing	4			1			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			1			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			2			16			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	45	0	30	30	30	0	40	0	45	45	45
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	38	0	29	29	29	0	40	0	34	34	34
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	0	5	0	5	5	5
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	141	141	141	141	141	141	141	141	141	141	141	141	141
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	24	24	24	24	20	20	20	30	30	30	48	48	48
g / C, Green / Cycle	0.17	0.17	0.17	0.17	0.15	0.15	0.15	0.21	0.21	0.21	0.34	0.34	0.34
(v / s)_i Volume / Saturation Flow Rate	0.04	0.15	0.15	0.15	0.12	0.12	0.12	0.02	0.20	0.13	0.18	0.18	0.27
s, saturation flow rate [veh/h]	1781	1870	1709	1544	1781	1834	1865	1781	1870	1527	1781	1824	1559
c, Capacity [veh/h]	308	323	295	267	259	267	271	382	401	327	600	615	525
d1, Uniform Delay [s]	50.42	56.43	56.58	56.46	58.65	58.63	58.62	44.31	54.21	49.71	37.82	37.62	41.98
k, delay calibration	0.11	0.11	0.11	0.11	0.13	0.13	0.13	0.11	0.23	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.42	5.84	6.93	8.37	8.37	7.97	7.77	0.09	16.51	1.80	3.41	3.17	11.60
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.25	0.84	0.85	0.87	0.84	0.84	0.84	0.08	0.92	0.60	0.54	0.52	0.79
d, Delay for Lane Group [s/veh]	50.84	62.27	63.52	64.83	67.02	66.60	66.39	44.41	70.72	51.51	41.22	40.79	53.58
Lane Group LOS	D	E	E	E	E	E	E	D	E	D	D	D	D
Critical Lane Group	No	No	No	Yes	Yes	No	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.41	9.90	9.30	8.62	8.17	8.36	8.48	0.92	14.66	6.47	9.71	9.63	14.82
50th-Percentile Queue Length [ft/ln]	60.30	247.5	232.4	215.4	204.33	209.01	211.91	22.97	366.48	161.80	242.70	240.85	370.52
95th-Percentile Queue Length [veh/ln]	4.34	15.06	14.30	13.43	12.86	13.10	13.25	1.65	20.94	10.64	14.82	14.72	21.13
95th-Percentile Queue Length [ft/ln]	108.5	376.5	357.4	335.8	321.55	327.56	331.28	41.34	523.46	266.10	370.44	368.11	528.36

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	50.84	62.70	64.45	66.90	66.47	66.39	44.41	70.72	51.51	41.08	40.79	53.58
Movement LOS	D	E	E	E	E	E	D	E	D	D	D	D
d_A, Approach Delay [s/veh]	62.30			66.67			62.96			45.95		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	57.86											
Intersection LOS	E											
Intersection V/C	0.780											

Emissions

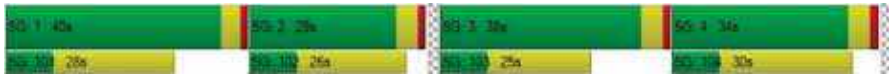
Vehicle Miles Traveled [mph]	1.83	6.44	5.98	5.49	70.59	72.47	73.62	13.38	154.26	82.77	139.46	139.46	180.46
Stops [stops/h]	61.58	252.7	237.3	220.0	208.68	213.45	216.42	23.46	374.28	165.24	247.86	245.97	378.40
Fuel consumption [US gal/h]	1.21	5.10	4.81	4.50	7.02	7.19	7.29	0.97	13.73	6.40	9.92	9.88	14.10
CO [g/h]	84.71	356.5	336.5	314.2	490.85	502.29	509.38	67.76	959.57	447.05	693.36	690.88	985.74
NOx [g/h]	16.48	69.38	65.48	61.13	95.50	97.73	99.11	13.18	186.70	86.98	134.90	134.42	191.79
VOC [g/h]	19.63	82.64	78.00	72.82	113.76	116.41	118.05	15.70	222.39	103.61	160.69	160.12	228.45

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.01	59.01	59.01	59.01
I_p,int, Pedestrian LOS Score for Intersectio	4.363	2.618	2.356	2.821
Crosswalk LOS	E	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	472	345	506	416
d_b, Bicycle Delay [s]	41.21	48.34	39.64	44.49
I_b,int, Bicycle LOS Score for Intersection	3.071	2.110	2.548	3.307
Bicycle LOS	C	B	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	19.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.807

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	57	39	125	30	32	7	3	776	26	42	692	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	8	0	2	0	0	0	0	232	26	16	287	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	65	39	127	30	32	7	3	1008	52	58	979	8
Peak Hour Factor	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	17	10	34	8	9	2	1	271	14	16	263	2
Total Analysis Volume [veh/h]	70	42	137	32	34	8	3	1084	56	62	1053	9
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	5			1			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			1			5		
v_co, Outbound Pedestrian Volume crossing	5			6			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			5			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			13			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	69
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	5	24	5	24	24	24	60	60	60	60	60	60
Amber [s]	3.0	3.1	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	5	7	5	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	10	15	10	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	9	47	9	47	47	47	23	23	23	23	23	23
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	5	5	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	70	70	70	70	70	70	70	70
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	15	15	15	15	47	47	47	47
g / C, Green / Cycle	0.21	0.21	0.21	0.21	0.68	0.68	0.68	0.68
(v / s)_i Volume / Saturation Flow Rate	0.05	0.11	0.03	0.02	0.01	0.62	0.13	0.57
s, saturation flow rate [veh/h]	1362	1621	1200	1799	531	1851	493	1867
c, Capacity [veh/h]	310	335	189	371	233	1252	180	1263
d1, Uniform Delay [s]	26.53	24.78	31.01	22.57	20.05	9.54	28.42	8.50
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.37	1.33	0.42	0.13	0.10	11.41	5.13	6.88
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.23	0.54	0.17	0.11	0.01	0.91	0.34	0.84
d, Delay for Lane Group [s/veh]	26.90	26.11	31.43	22.71	20.15	20.95	33.55	15.38
Lane Group LOS	C	C	C	C	C	C	C	B
Critical Lane Group	No	Yes	No	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	1.05	2.69	0.53	0.56	0.04	14.83	1.23	11.43
50th-Percentile Queue Length [ft/ln]	26.26	67.21	13.19	14.05	1.07	370.77	30.81	285.64
95th-Percentile Queue Length [veh/ln]	1.89	4.84	0.95	1.01	0.08	21.15	2.22	16.97
95th-Percentile Queue Length [ft/ln]	47.26	120.99	23.74	25.29	1.93	528.66	55.46	424.23

A395

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.90	26.11	26.11	31.43	22.71	22.71	20.15	20.95	20.95	33.55	15.38	15.38
Movement LOS	C	C	C	C	C	C	C	C	C	C	B	B
d_A, Approach Delay [s/veh]	26.33			26.48			20.95			16.38		
Approach LOS	C			C			C			B		
d_I, Intersection Delay [s/veh]	19.64											
Intersection LOS	B											
Intersection V/C	0.807											

Emissions

Vehicle Miles Traveled [mph]	4.37	11.18	2.77	3.64	1.30	494.53	5.59	95.78
Stops [stops/h]	54.01	138.27	27.13	28.90	2.20	762.72	63.38	587.61
Fuel consumption [US gal/h]	0.79	1.98	0.43	0.47	0.08	30.03	0.92	9.88
CO [g/h]	55.01	138.70	30.29	32.75	5.54	2098.77	64.16	690.93
NOx [g/h]	10.70	26.99	5.89	6.37	1.08	408.35	12.48	134.43
VOC [g/h]	12.75	32.15	7.02	7.59	1.28	486.41	14.87	160.13

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.86	24.86	24.86	24.86
l_p,int, Pedestrian LOS Score for Intersectio	2.123	1.965	2.642	2.646
Crosswalk LOS	B	A	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1226	1226	540	540
d_b, Bicycle Delay [s]	5.25	5.25	18.77	18.69
l_b,int, Bicycle LOS Score for Intersection	1.970	1.682	3.446	3.414
Bicycle LOS	A	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	15.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.830

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	4	0	8	129	3	19	9	917	1	2	733	120
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	234	0	0	303	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	0	8	129	3	19	9	1151	1	2	1036	120
Peak Hour Factor	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	0	2	34	1	5	2	306	0	1	275	32
Total Analysis Volume [veh/h]	4	0	9	137	3	20	10	1224	1	2	1102	128
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	21			11			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			21			11		
v_co, Outbound Pedestrian Volume crossing	10			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			10		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			9			4		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	80.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	30	0	30	30	30	90	90	90	90	90	90
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	16	16	96	96	96	96
g / C, Green / Cycle	0.13	0.13	0.80	0.80	0.80	0.80
(v / s)_i Volume / Saturation Flow Rate	0.01	0.11	0.02	0.66	0.00	0.67
s, saturation flow rate [veh/h]	1708	1461	453	1870	455	1830
c, Capacity [veh/h]	268	252	221	1491	235	1459
d1, Uniform Delay [s]	45.34	50.21	25.57	7.13	22.80	7.51
k, delay calibration	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	2.65	0.39	5.22	0.07	6.09
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.05	0.64	0.05	0.82	0.01	0.84
d, Delay for Lane Group [s/veh]	45.42	52.86	25.95	12.35	22.86	13.60
Lane Group LOS	D	D	C	B	C	B
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.35	4.85	0.22	16.63	0.04	17.75
50th-Percentile Queue Length [ft/ln]	8.73	121.18	5.41	415.70	1.00	443.71
95th-Percentile Queue Length [veh/ln]	0.63	8.46	0.39	23.32	0.07	24.66
95th-Percentile Queue Length [ft/ln]	15.71	211.45	9.74	582.89	1.80	616.44

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	45.42	45.42	45.42	52.86	52.86	52.86	25.95	12.35	12.35	22.86	13.60	13.60
Movement LOS	D	D	D	D	D	D	C	B	B	C	B	B
d_A, Approach Delay [s/veh]	45.42			52.86			12.46			13.61		
Approach LOS	D			D			B			B		
d_I, Intersection Delay [s/veh]	15.61											
Intersection LOS	B											
Intersection V/C	0.830											

Emissions

Vehicle Miles Traveled [mph]	0.37	3.80	0.90	110.48	0.59	362.94
Stops [stops/h]	10.47	145.42	6.49	498.84	1.20	532.46
Fuel consumption [US gal/h]	0.18	2.68	0.12	9.96	0.04	21.77
CO [g/h]	12.38	187.38	8.27	696.33	2.83	1521.54
NOx [g/h]	2.41	36.46	1.61	135.48	0.55	296.04
VOC [g/h]	2.87	43.43	1.92	161.38	0.66	352.63

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
l_p,int, Pedestrian LOS Score for Intersectio	1.739	1.888	2.599	2.868
Crosswalk LOS	A	A	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	432	432	1432	1432
d_b, Bicycle Delay [s]	36.91	36.91	4.87	4.85
l_b,int, Bicycle LOS Score for Intersection	1.581	1.824	3.597	3.592
Bicycle LOS	A	A	D	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	19.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.752

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	39	1	85	49	1	10	3	1098	12	33	813	17
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	5	0	4	8	226	0	0	299	12
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	39	1	85	54	1	14	11	1324	12	33	1112	29
Peak Hour Factor	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	0	22	14	0	4	3	337	3	8	283	7
Total Analysis Volume [veh/h]	40	1	87	55	1	14	11	1348	12	34	1132	30
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	11			2			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			11			2		
v_co, Outbound Pedestrian Volume crossing	13			3			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			3			13		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			0			8			3		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	113	113	113	113	113	113	113	113	113	113
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	11	11	4	4	4	1	77	77	3	78
g / C, Green / Cycle	0.10	0.10	0.04	0.04	0.04	0.01	0.68	0.68	0.02	0.69
(v / s)_i Volume / Saturation Flow Rate	0.02	0.06	0.02	0.02	0.01	0.01	0.36	0.36	0.02	0.62
s, saturation flow rate [veh/h]	1781	1508	1781	1784	1529	1781	1870	1863	1781	1860
c, Capacity [veh/h]	174	147	70	70	60	18	1270	1265	44	1290
d1, Uniform Delay [s]	47.06	48.85	52.99	52.98	52.62	55.67	9.14	9.14	54.80	14.15
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.23	0.11	0.33
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.67	3.84	3.68	3.66	1.97	26.90	0.75	0.76	24.95	7.25
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.23	0.60	0.40	0.40	0.23	0.59	0.54	0.54	0.78	0.90
d, Delay for Lane Group [s/veh]	47.72	52.69	56.66	56.65	54.58	82.57	9.89	9.90	79.76	21.40
Lane Group LOS	D	D	E	E	D	F	A	A	E	C
Critical Lane Group	No	Yes	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.08	2.55	0.87	0.87	0.43	0.45	8.19	8.17	1.27	24.13
50th-Percentile Queue Length [ft/ln]	27.03	63.82	21.79	21.80	10.76	11.30	204.71	204.35	31.77	603.34
95th-Percentile Queue Length [veh/ln]	1.95	4.60	1.57	1.57	0.77	0.81	12.88	12.86	2.29	32.19
95th-Percentile Queue Length [ft/ln]	48.65	114.88	39.22	39.23	19.36	20.35	322.03	321.57	57.19	804.76

A400

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	47.72	52.69	52.69	56.66	56.65	54.58	82.57	9.90	9.90	79.76	21.40	21.40
Movement LOS	D	D	D	E	E	D	F	A	A	E	C	C
d_A, Approach Delay [s/veh]	51.14			56.24			10.48			23.06		
Approach LOS	D			E			B			C		
d_I, Intersection Delay [s/veh]	18.96											
Intersection LOS	B											
Intersection V/C	0.752											

Emissions

Vehicle Miles Traveled [mph]	1.82	3.99	0.93	0.93	0.47	3.25	200.91	200.39	4.36	148.86
Stops [stops/h]	34.48	81.42	27.80	27.81	13.72	14.42	261.16	260.70	40.53	769.72
Fuel consumption [US gal/h]	0.60	1.44	0.40	0.40	0.19	0.39	11.41	11.38	0.90	14.71
CO [g/h]	42.11	100.34	27.71	27.71	13.44	26.99	797.38	795.48	63.13	1028.00
NOx [g/h]	8.19	19.52	5.39	5.39	2.61	5.25	155.14	154.77	12.28	200.01
VOC [g/h]	9.76	23.25	6.42	6.42	3.11	6.25	184.80	184.36	14.63	238.25

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	45.97	45.97	45.97	45.97
l_p,int, Pedestrian LOS Score for Intersectio	1.998	2.151	2.661	2.827
Crosswalk LOS	A	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	532	532	354	354
d_b, Bicycle Delay [s]	30.44	30.42	38.36	38.27
l_b,int, Bicycle LOS Score for Intersection	1.771	1.675	2.691	3.533
Bicycle LOS	A	A	B	D

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	19.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.935

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

A401

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	462	34	19	1374	917	214
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	83	0	0	231	311	20
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	545	34	19	1605	1228	234
Peak Hour Factor	0.9590	0.9590	0.9590	0.9590	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	142	9	5	418	320	61
Total Analysis Volume [veh/h]	568	35	20	1674	1281	244
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	2		0		1	
v_ci, Inbound Pedestrian Volume crossing mi	1		0		2	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	3		10		6	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	31	31
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	40	13	100	87	87
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	71	71	71	71	71	71
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	24	24	1	37	32	32
g / C, Green / Cycle	0.35	0.35	0.02	0.52	0.45	0.45
(v / s)_i Volume / Saturation Flow Rate	0.32	0.02	0.01	0.47	0.36	0.16
s, saturation flow rate [veh/h]	1781	1567	1781	3560	3560	1550
c, Capacity [veh/h]	615	542	33	1843	1601	697
d1, Uniform Delay [s]	22.28	15.51	34.51	15.56	16.77	12.68
k, delay calibration	0.12	0.04	0.04	0.15	0.15	0.15
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	7.21	0.02	6.44	2.80	1.37	0.43
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.92	0.06	0.60	0.91	0.80	0.35
d, Delay for Lane Group [s/veh]	29.49	15.53	40.95	18.36	18.13	13.11
Lane Group LOS	C	B	D	B	B	B
Critical Lane Group	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	9.55	0.36	0.39	11.12	8.00	2.30
50th-Percentile Queue Length [ft/ln]	238.79	8.99	9.77	278.07	200.12	57.54
95th-Percentile Queue Length [veh/ln]	14.62	0.65	0.70	16.59	12.64	4.14
95th-Percentile Queue Length [ft/ln]	365.50	16.19	17.58	414.81	316.12	103.57

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	29.49	15.53	40.95	18.36	18.13	13.11
Movement LOS	C	B	D	B	B	B
d_A, Approach Delay [s/veh]	28.68		18.63		17.33	
Approach LOS	C		B		B	
d_I, Intersection Delay [s/veh]	19.69					
Intersection LOS	B					
Intersection V/C	0.935					

Emissions

Vehicle Miles Traveled [mph]	415.70	25.62	2.56	214.45	134.60	25.64
Stops [stops/h]	486.41	18.32	19.89	1132.85	815.26	117.21
Fuel consumption [US gal/h]	23.21	1.27	0.38	21.34	15.99	2.51
CO [g/h]	1622.28	88.52	26.70	1491.82	1117.65	175.43
NOx [g/h]	315.64	17.22	5.20	290.25	217.45	34.13
VOC [g/h]	375.98	20.51	6.19	345.74	259.03	40.66

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	25.20	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.209	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1013	2674	2306
d_b, Bicycle Delay [s]	8.62	4.03	0.83
l_b,int, Bicycle LOS Score for Intersection	1.560	2.957	2.818
Bicycle LOS	A	C	C

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	63.3
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.336

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

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Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	516	0	320	0	1416	359	0	845	694	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	156	0	8	0	266	48	0	323	781	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	672	0	328	0	1682	407	0	1168	1475	0	0	0
Peak Hour Factor	0.9624	1.0000	0.9624	1.0000	0.9624	0.9624	1.0000	0.9624	0.9624	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	175	0	85	0	437	106	0	303	383	0	0	0
Total Analysis Volume [veh/h]	698	0	341	0	1748	423	0	1214	1533	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			14			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	14			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			5			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	33	0	0	0	112	0	0	112	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	5	0	0	5	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				Yes			Yes				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	145	145	145	145	145	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
I2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	29	29	108	108	108	
g / C, Green / Cycle	0.20	0.20	0.74	0.74	0.74	
(v / s)_i Volume / Saturation Flow Rate	0.20	0.12	0.34	0.24	0.99	
s, saturation flow rate [veh/h]	3459	2754	5094	5094	1554	
c, Capacity [veh/h]	692	551	3794	3794	1157	
d1, Uniform Delay [s]	58.00	52.80	7.19	6.20	17.36	
k, delay calibration	0.11	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	18.15	1.14	0.40	0.22	152.19	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	1.01	0.62	0.46	0.32	1.32	
d, Delay for Lane Group [s/veh]	76.15	53.94	7.59	6.42	169.55	
Lane Group LOS	F	D	A	A	F	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	14.43	5.78	6.70	4.01	80.39	
50th-Percentile Queue Length [ft/ln]	360.69	144.48	167.52	100.16	2009.78	
95th-Percentile Queue Length [veh/ln]	20.76	9.72	10.95	7.21	118.63	
95th-Percentile Queue Length [ft/ln]	519.00	243.05	273.65	180.29	2965.84	

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	76.15	0.00	53.94	0.00	7.59	0.00	0.00	6.42	169.55	0.00	0.00	0.00
Movement LOS	F		D		A			A	F			
d_A, Approach Delay [s/veh]	68.86			6.16			97.46			0.00		
Approach LOS	E			A			F			A		
d_I, Intersection Delay [s/veh]	63.25											
Intersection LOS	E											
Intersection V/C	1.336											

Emissions

Vehicle Miles Traveled [mph]	16.56	8.09	183.67	133.32	168.35	
Stops [stops/h]	716.40	286.97	499.10	298.41	1995.92	
Fuel consumption [US gal/h]	15.45	5.66	13.02	8.72	70.84	
CO [g/h]	1080.30	395.70	910.04	609.76	4951.82	
NOx [g/h]	210.19	76.99	177.06	118.64	963.44	
VOC [g/h]	250.37	91.71	210.91	141.32	1147.63	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	63.78	0.00	63.78
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.078	0.000	1.447
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	400	1490	1490	0
d_b, Bicycle Delay [s]	46.40	4.72	4.73	72.50
l_b,int, Bicycle LOS Score for Intersection	1.560	2.521	3.070	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	173.3
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.920

Intersection Setup

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	200.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	270	0	964	0	0	0	0	1623	385	0	1101	313
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	29	0	290	0	0	0	0	414	9	0	1075	292
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	299	0	1254	0	0	0	0	2037	394	0	2176	605
Peak Hour Factor	0.9741	1.0000	0.9741	1.0000	1.0000	1.0000	1.0000	0.9741	0.9741	1.0000	0.9741	0.9741
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	77	0	322	0	0	0	0	523	101	0	558	155
Total Analysis Volume [veh/h]	307	0	1287	0	0	0	0	2091	404	0	2234	621
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	2.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	7	0	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	30	0	0	16	0	0	16	0
Amber [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	5	0	5	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	10	0	10	0	10	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No			No	
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	25	0	25	0	25	0	0	95	0	0	95	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	5	0	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No		No			No			No	
Maximum Recall	No		No		No			No			No	
Pedestrian Recall	No		No		No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	C	C	R	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	21	46	21	91	91	116	91
g / C, Green / Cycle	0.14	0.32	0.14	0.63	0.63	0.80	0.63
(v / s)_i Volume / Saturation Flow Rate	0.11	0.78	0.00	0.70	0.25	0.74	0.66
s, saturation flow rate [veh/h]	2752	1658	1870	3003	1589	3003	937
c, Capacity [veh/h]	410	526	296	1884	998	2402	588
d1, Uniform Delay [s]	59.76	49.50	0.00	27.00	13.48	11.33	27.00
k, delay calibration	0.11	0.50	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.75	656.53	0.00	57.61	1.22	7.95	52.79
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.75	2.45	0.00	1.11	0.40	0.93	1.06
d, Delay for Lane Group [s/veh]	62.52	706.03	0.00	84.61	14.70	19.28	79.79
Lane Group LOS	E	F	A	F	B	B	F
Critical Lane Group	No	Yes	No	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	5.61	57.46	0.00	30.49	6.90	16.81	27.75
50th-Percentile Queue Length [ft/ln]	140.35	1436.46	0.00	762.17	172.54	420.28	693.84
95th-Percentile Queue Length [veh/ln]	9.50	94.99	0.00	43.02	11.21	23.54	38.10
95th-Percentile Queue Length [ft/ln]	237.50	2374.87	0.00	1075.49	280.25	588.38	952.48

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	62.52	0.00	706.03	0.00	0.00	0.00	0.00	84.61	14.70	0.00	19.28	79.79
Movement LOS	E		F	A	A	A		F	B		B	F
d_A, Approach Delay [s/veh]	582.09			0.00			73.29			32.44		
Approach LOS	F			A			E			C		
d_I, Intersection Delay [s/veh]	173.29											
Intersection LOS	F											
Intersection V/C	0.920											

Emissions

Vehicle Miles Traveled [mph]	7.28	30.51	0.00	229.62	44.37	52.80	14.68
Stops [stops/h]	278.77	2853.11	0.00	2270.76	171.35	1252.14	689.05
Fuel consumption [US gal/h]	5.74	201.89	0.00	57.99	3.98	17.86	14.49
CO [g/h]	401.56	14111.80	0.00	4053.81	278.34	1248.11	1013.09
NOx [g/h]	78.13	2745.64	0.00	788.72	54.16	242.84	197.11
VOC [g/h]	93.07	3270.55	0.00	939.51	64.51	289.26	234.79

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	9.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.78	63.78	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.713	2.042	0.000	0.000
Crosswalk LOS	B	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	290	290	1255	1600
d_b, Bicycle Delay [s]	53.02	53.02	10.06	2.90
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.932	3.130
Bicycle LOS	A	A	C	C

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	54.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.715

Intersection Setup

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name				Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	149	99	21	40	97	23	100	525	60	20	351	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	86	0	5	0	0	1	1	66	100	58	120	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	235	99	26	40	97	24	101	591	160	78	471	9
Peak Hour Factor	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	63	27	7	11	26	6	27	158	43	21	126	2
Total Analysis Volume [veh/h]	252	106	28	43	104	26	108	633	171	84	504	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			10			11		
v_di, Inbound Pedestrian Volume crossing m	11			10			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			12			12		
v_ci, Inbound Pedestrian Volume crossing mi	12			12			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	7			8			6			11		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	35	35	35	35	35	35	30	60	60	30	30	30
Amber [s]	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	28	28	28	28	28	28	9	55	55	9	55	55
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	4	4	4	4	4
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	0.00	2.10	0.00	2.00
g_i, Effective Green Time [s]	24	24	24	24	60	51	60	51
g / C, Green / Cycle	0.20	0.20	0.20	0.20	0.50	0.42	0.50	0.43
(v / s)_i Volume / Saturation Flow Rate	0.14	0.08	0.02	0.07	0.11	0.45	0.10	0.28
s, saturation flow rate [veh/h]	1781	1777	1781	1791	991	1785	806	1862
c, Capacity [veh/h]	355	354	355	357	391	757	215	791
d1, Uniform Delay [s]	44.82	41.62	39.43	41.49	19.60	34.55	27.34	27.40
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.40	0.11	0.21
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.45	3.07	0.70	2.86	0.38	47.11	1.16	1.77
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.71	0.38	0.12	0.36	0.28	1.06	0.39	0.65
d, Delay for Lane Group [s/veh]	56.27	44.69	40.13	44.36	19.98	81.66	28.49	29.18
Lane Group LOS	E	D	D	D	B	F	C	C
Critical Lane Group	Yes	No	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	8.12	3.75	1.13	3.65	1.65	31.35	1.30	11.95
50th-Percentile Queue Length [ft/ln]	202.92	93.81	28.20	91.33	41.20	783.78	32.53	298.78
95th-Percentile Queue Length [veh/ln]	12.79	6.75	2.03	6.58	2.97	42.39	2.34	17.62
95th-Percentile Queue Length [ft/ln]	319.73	168.85	50.76	164.39	74.17	1059.87	58.55	440.52

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	56.27	44.69	44.69	40.13	44.36	44.36	19.98	81.66	81.66	28.49	29.18	29.18
Movement LOS	E	D	D	D	D	D	B	F	F	C	C	C
d_A, Approach Delay [s/veh]	52.25			43.31			74.36			29.08		
Approach LOS	D			D			E			C		
d_I, Intersection Delay [s/veh]	54.55											
Intersection LOS	D											
Intersection V/C	0.715											

Emissions

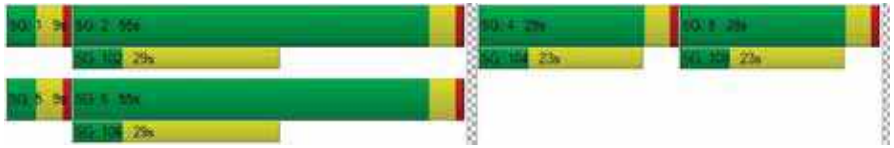
Vehicle Miles Traveled [mph]	145.25	77.24	1.02	3.08	25.63	190.83	14.82	90.66
Stops [stops/h]	243.51	112.57	33.84	109.59	49.44	940.54	39.04	358.54
Fuel consumption [US gal/h]	10.21	5.02	0.53	1.73	1.77	26.41	1.31	8.76
CO [g/h]	713.69	350.89	36.82	121.09	123.55	1846.14	91.75	612.66
NOx [g/h]	138.86	68.27	7.16	23.56	24.04	359.19	17.85	119.20
VOC [g/h]	165.40	81.32	8.53	28.06	28.63	427.86	21.26	141.99

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
l_p,int, Pedestrian LOS Score for Intersectio	2.249	2.129	2.558	2.377
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	390	390	838	838
d_b, Bicycle Delay [s]	39.02	39.04	20.30	20.35
l_b,int, Bicycle LOS Score for Intersection	2.197	1.845	3.064	2.546
Bicycle LOS	B	A	C	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.AM.vistro Scenario 26 Cumulative Plus Project AM
Report File: C:\...\CP AM.pdf 2/10/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road and US 101 NB Ramps	Signalized	HCM 7th Edition	NB Thru	1.024	34.6	C
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	EB Left	0.924	43.9	D
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	SB Left	0.812	31.4	C
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	NB Left	0.879	70.9	E
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	EB Left	1.000	33.6	C
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	NB Thru	0.733	56.2	E
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	EB Right	0.826	61.9	E
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	SB Thru	0.901	41.1	D
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	NB Left	0.630	52.2	D
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	EB Thru	0.786	60.2	E
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	SB Left	0.736	17.9	B
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	SB Left	0.919	27.8	C
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	NB Right	1.168	125.4	F
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	WB Right	1.254	144.6	F
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	2.031	136.8	F
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	1.218	90.3	F

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V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

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Intersection Level Of Service Report
Intersection 1: Marsh Road and US 101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	34.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.024

Intersection Setup

Name	Marsh Road (SR 84)		Marsh Road		US 101 NB Off-Ramp	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

Volumes

Name	Marsh Road (SR 84)		Marsh Road		US 101 NB Off-Ramp	
Base Volume Input [veh/h]	2047	0	0	933	734	952
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2047	0	0	933	734	952
Peak Hour Factor	0.9670	1.0000	1.0000	0.9670	0.9670	0.9670
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	529	0	0	241	190	246
Total Analysis Volume [veh/h]	2117	0	0	965	759	984
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	1		0		2	
v_ci, Inbound Pedestrian Volume crossing mi	2		0		1	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	3		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	60	0	0	60	60	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
l1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
l2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	30	0	0	30	60	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	No	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	51	51	34	34
g / C, Green / Cycle	0.57	0.57	0.38	0.38
(v / s)_i Volume / Saturation Flow Rate	0.59	0.27	0.22	0.35
s, saturation flow rate [veh/h]	3560	3560	3459	2813
c, Capacity [veh/h]	2026	2026	1317	1071
d1, Uniform Delay [s]	19.39	11.46	22.10	26.53
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	32.84	0.80	0.15	1.45
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.04	0.48	0.58	0.92
d, Delay for Lane Group [s/veh]	52.22	12.26	22.25	27.98
Lane Group LOS	F	B	C	C
Critical Lane Group	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	27.75	5.44	6.16	9.76
50th-Percentile Queue Length [ft/ln]	693.87	135.94	153.94	243.92
95th-Percentile Queue Length [veh/ln]	37.73	9.26	10.23	14.88
95th-Percentile Queue Length [ft/ln]	943.17	231.54	255.68	371.99

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	52.22	0.00	0.00	12.26	22.25	27.98
Movement LOS	F			B	C	C
d_A, Approach Delay [s/veh]	52.22		12.26		25.49	
Approach LOS	D		B		C	
d_I, Intersection Delay [s/veh]	34.57					
Intersection LOS	C					
Intersection V/C	1.024					

Emissions

Vehicle Miles Traveled [mph]	153.36	22.81	18.00	23.33
Stops [stops/h]	2220.39	434.99	492.61	780.54
Fuel consumption [US gal/h]	41.08	5.75	6.90	10.88
CO [g/h]	2871.32	402.00	482.25	760.26
NOx [g/h]	558.65	78.22	93.83	147.92
VOC [g/h]	665.46	93.17	111.77	176.20

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	36.45	34.67
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.124	2.555
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	564	564	1240
d_b, Bicycle Delay [s]	23.22	23.18	6.50
l_b,int, Bicycle LOS Score for Intersection	3.306	2.356	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	43.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.924

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

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Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	1107	1476	217	1393	500
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	0	0	0	17
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1112	1476	217	1393	517
Peak Hour Factor	1.0000	0.9590	0.9590	1.0000	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	290	385	54	363	135
Total Analysis Volume [veh/h]	0	1160	1539	217	1453	539
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	2		1		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	60	60	0	35	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	10	0	5	0
Pedestrian Clearance [s]	0	16	0	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	55	55	0	35	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	53	50	33	33
g / C, Green / Cycle	0.58	0.56	0.37	0.37
(v / s)_i Volume / Saturation Flow Rate	0.29	0.43	0.42	0.34
s, saturation flow rate [veh/h]	4000	3560	3459	1589
c, Capacity [veh/h]	2333	1994	1268	583
d1, Uniform Delay [s]	11.00	15.34	28.50	27.31
k, delay calibration	0.50	0.50	0.08	0.38
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.76	2.97	67.27	18.70
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.50	0.77	1.15	0.92
d, Delay for Lane Group [s/veh]	11.76	18.31	95.77	46.02
Lane Group LOS	B	B	F	D
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	6.40	11.51	24.81	13.59
50th-Percentile Queue Length [ft/ln]	159.99	287.87	620.32	339.72
95th-Percentile Queue Length [veh/ln]	10.55	17.08	36.03	19.63
95th-Percentile Queue Length [ft/ln]	263.71	427.00	900.66	490.86

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	11.76	18.31	0.00	95.77	46.02
Movement LOS		B	B		F	D
d_A, Approach Delay [s/veh]	11.76		18.31		82.31	
Approach LOS	B		B		F	
d_I, Intersection Delay [s/veh]	43.87					
Intersection LOS	D					
Intersection V/C	0.924					

Emissions

Vehicle Miles Traveled [mph]	145.09	147.17	34.36	12.75
Stops [stops/h]	511.97	921.19	1985.01	543.56
Fuel consumption [US gal/h]	11.58	18.27	40.70	8.57
CO [g/h]	809.34	1277.33	2844.62	599.38
NOx [g/h]	157.47	248.52	553.46	116.62
VOC [g/h]	187.57	296.03	659.27	138.91

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.45	0.00	32.09
l_p,int, Pedestrian LOS Score for Intersectio	2.933	0.000	2.613
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1120	1120	687
d_b, Bicycle Delay [s]	8.72	8.72	19.40
l_b,int, Bicycle LOS Score for Intersection	2.517	2.829	1.560
Bicycle LOS	B	C	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	31.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.812

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	1	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	1	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Rolison Road			Scott Drive		
Base Volume Input [veh/h]	60	1522	9	274	1412	358	297	8	2	15	5	175
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	0	0	17	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	60	1527	9	274	1429	358	297	8	2	15	5	175
Peak Hour Factor	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540	0.9540
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	400	2	72	374	94	78	2	1	4	1	46
Total Analysis Volume [veh/h]	63	1601	9	287	1498	375	311	8	2	16	5	183
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			1			1			2		
v_di, Inbound Pedestrian Volume crossing m	1			2			2			1		
v_co, Outbound Pedestrian Volume crossing	1			0			0			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			0			0			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	135
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	4	4	8	3	8
Auxiliary Signal Groups												
Maximum Green [s]	15	60	60	20	65	65	40	40	40	0	40	0
Amber [s]	3.0	4.0	4.0	3.0	4.0	4.0	3.2	3.2	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	8	8	8	0	8	0
Pedestrian Clearance [s]	0	21	21	0	21	21	24	24	24	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	85	85	14	79	79	20	20	20	0	16	0
Lead / Lag	Lead	-	-	Lead	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	10	10	4	10	10	4	4	4	0	6	0
Vehicle Extension [s]	2.5	3.5	3.5	2.0	3.5	3.5	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	135	135	135	135	135	135	135	135	135	135
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	4.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	8	84	84	10	88	88	17	17	14	14
g / C, Green / Cycle	0.06	0.62	0.62	0.07	0.65	0.65	0.13	0.13	0.10	0.10
(v / s)_i Volume / Saturation Flow Rate	0.04	0.30	0.30	0.08	0.50	0.54	0.09	0.09	0.01	0.07
s, saturation flow rate [veh/h]	1781	3560	1865	3459	1870	1747	1781	1782	1801	2750
c, Capacity [veh/h]	108	2214	1160	256	1216	1135	225	225	187	285
d1, Uniform Delay [s]	61.73	13.72	13.72	62.50	16.56	17.82	56.64	56.64	54.87	58.00
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.65	0.74	1.41	58.94	4.75	6.87	3.13	3.12	0.20	1.79
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.58	0.48	0.48	1.12	0.77	0.82	0.71	0.71	0.11	0.64
d, Delay for Lane Group [s/veh]	65.38	14.46	15.13	121.44	21.31	24.69	59.76	59.76	55.06	59.79
Lane Group LOS	E	B	B	F	C	C	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.21	8.54	9.16	6.47	20.35	22.34	5.50	5.51	0.67	3.10
50th-Percentile Queue Length [ft/ln]	55.20	213.51	229.04	161.76	508.71	558.51	137.60	137.71	16.70	77.51
95th-Percentile Queue Length [veh/ln]	3.97	13.33	14.13	11.04	27.75	30.09	9.35	9.36	1.20	5.58
95th-Percentile Queue Length [ft/ln]	99.36	333.33	353.14	275.95	693.66	752.30	233.79	233.93	30.05	139.51

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	65.38	14.69	15.13	121.44	22.57	24.69	59.76	59.76	59.76	55.06	55.06	59.79
Movement LOS	E	B	B	F	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	16.60			36.08			59.76			59.30		
Approach LOS	B			D			E			E		
d_I, Intersection Delay [s/veh]	31.43											
Intersection LOS	C											
Intersection V/C	0.812											

Emissions

Vehicle Miles Traveled [mph]	12.98	217.68	114.01	35.90	117.13	117.13	4.84	4.84	1.43	12.45
Stops [stops/h]	58.88	455.49	244.31	345.09	542.63	595.75	146.78	146.89	17.81	165.35
Fuel consumption [US gal/h]	1.78	14.83	7.89	11.05	12.61	13.65	2.73	2.73	0.37	3.42
CO [g/h]	124.12	1036.76	551.28	772.73	881.17	954.12	190.94	191.07	25.71	239.08
NOx [g/h]	24.15	201.72	107.26	150.35	171.44	185.64	37.15	37.18	5.00	46.52
VOC [g/h]	28.77	240.28	127.77	179.09	204.22	221.13	44.25	44.28	5.96	55.41

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.03	56.03	56.95	56.95
l_p,int, Pedestrian LOS Score for Intersectio	3.131	3.304	2.167	2.402
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1185	1096	234	175
d_b, Bicycle Delay [s]	11.20	13.78	52.62	56.24
l_b,int, Bicycle LOS Score for Intersection	2.480	3.342	2.089	1.896
Bicycle LOS	B	C	B	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	70.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.879

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Drive		
Base Volume Input [veh/h]	281	1104	120	28	1141	396	537	54	195	57	66	21
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	0	0	17	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	281	1109	120	28	1158	396	537	54	195	57	66	21
Peak Hour Factor	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530	0.9530
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	74	291	31	7	304	104	141	14	51	15	17	6
Total Analysis Volume [veh/h]	295	1164	126	29	1215	416	563	57	205	60	69	22
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1			2			1			1		
v_di, Inbound Pedestrian Volume crossing m	1			1			1			2		
v_co, Outbound Pedestrian Volume crossing	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	2			0			6			0		

A420

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	155
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	20	80	80	18	72	72	35	35	35	0	35	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	58	58	15	58	58	37	45	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	155	155	155	155	155	155	155	155	155	155	155
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	13	96	96	5	88	88	32	32	32	14	14
g / C, Green / Cycle	0.08	0.62	0.62	0.03	0.57	0.57	0.21	0.21	0.21	0.09	0.09
(v / s)_i Volume / Saturation Flow Rate	0.17	0.35	0.35	0.02	0.45	0.47	0.17	0.17	0.13	0.03	0.05
s, saturation flow rate [veh/h]	1781	1870	1798	1781	1870	1711	1781	1797	1556	1781	1788
c, Capacity [veh/h]	149	1160	1115	60	1066	976	368	371	321	156	157
d1, Uniform Delay [s]	71.00	17.15	17.32	73.53	25.82	26.78	59.06	59.01	56.03	66.74	67.95
k, delay calibration	0.50	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	461.93	1.97	2.13	2.19	5.72	7.53	3.94	3.82	1.57	1.15	2.50
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.97	0.56	0.57	0.48	0.78	0.82	0.84	0.84	0.64	0.38	0.58
d, Delay for Lane Group [s/veh]	532.93	19.12	19.46	75.72	31.54	34.31	63.01	62.83	57.60	67.89	70.46
Lane Group LOS	F	B	B	E	C	C	E	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	25.09	13.85	13.73	1.17	24.83	24.97	12.20	12.23	7.56	2.32	3.62
50th-Percentile Queue Length [ft/ln]	627.25	346.24	343.31	29.29	620.65	624.28	304.93	305.81	188.92	58.11	90.54
95th-Percentile Queue Length [veh/ln]	39.72	19.95	19.81	2.11	33.00	33.17	17.92	17.97	12.06	4.18	6.52
95th-Percentile Queue Length [ft/ln]	993.05	498.82	495.25	52.72	824.94	829.17	448.12	449.20	301.62	104.60	162.98

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	532.93	19.27	19.46	75.72	32.41	34.31	62.93	62.83	57.60	67.89	70.46	70.46
Movement LOS	F	B	B	E	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	114.89			33.64			61.60			69.44		
Approach LOS	F			C			E			E		
d_I, Intersection Delay [s/veh]	70.89											
Intersection LOS	E											
Intersection V/C	0.879											

Emissions

Vehicle Miles Traveled [mph]	46.30	102.30	100.19	5.97	171.80	164.22	35.80	35.97	23.73	3.39	5.14
Stops [stops/h]	582.73	321.66	318.95	27.21	576.61	579.98	283.29	284.10	175.51	53.99	84.12
Fuel consumption [US gal/h]	38.13	8.85	8.74	0.88	16.24	16.19	6.66	6.68	4.14	1.19	1.86
CO [g/h]	2665.46	618.91	611.25	61.45	1134.99	1131.40	465.65	466.90	289.61	83.05	129.88
NOx [g/h]	518.60	120.42	118.93	11.96	220.83	220.13	90.60	90.84	56.35	16.16	25.27
VOC [g/h]	617.75	143.44	141.66	14.24	263.05	262.21	107.92	108.21	67.12	19.25	30.10

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	66.89	66.89	66.89	66.89
l_p,int, Pedestrian LOS Score for Intersectio	3.060	3.125	2.483	2.064
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	689	689	529	423
d_b, Bicycle Delay [s]	33.33	33.30	42.05	48.17
l_b,int, Bicycle LOS Score for Intersection	2.867	2.929	2.921	1.809
Bicycle LOS	C	C	C	A

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	33.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.000

Intersection Setup

Name				Marsh Road			Bay Road			Bay Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name				Marsh Road			Bay Road			Bay Road		
Base Volume Input [veh/h]	0	946	72	324	978	62	193	44	1	54	49	385
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	5	0	0	17	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	951	72	324	995	62	193	44	1	54	49	385
Peak Hour Factor	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470	0.9470
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	251	19	86	263	16	51	12	0	14	13	102
Total Analysis Volume [veh/h]	0	1004	76	342	1051	65	204	46	1	57	52	407
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			5			0			5		
v_di, Inbound Pedestrian Volume crossing m	0			5			0			5		
v_co, Outbound Pedestrian Volume crossing	1			1			1			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			1			1			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			3			2		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	8.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	7	0	7	0	7	0	7	7	7	0	7	0
Pedestrian Clearance [s]	17	0	17	0	17	0	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	56	34	56	22	56	34	34	34	34	0	34	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
l2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	32	32	19	54	54	32	32
g / C, Green / Cycle	0.35	0.35	0.21	0.59	0.59	0.35	0.35
(v / s)_i Volume / Saturation Flow Rate	0.31	0.31	0.19	0.30	0.30	0.46	0.30
s, saturation flow rate [veh/h]	1870	1651	1781	1870	1826	550	1729
c, Capacity [veh/h]	694	578	376	1112	1086	267	657
d1, Uniform Delay [s]	27.40	27.45	34.66	10.58	10.62	34.08	26.93
k, delay calibration	0.50	0.50	0.15	0.50	0.50	0.50	0.44
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	10.70	17.14	11.50	1.65	1.71	41.24	8.15
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.82	0.88	0.91	0.51	0.51	0.94	0.79
d, Delay for Lane Group [s/veh]	38.10	44.60	46.17	12.23	12.33	75.31	35.08
Lane Group LOS	D	D	D	B	B	E	D
Critical Lane Group	No	Yes	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	13.09	12.55	8.23	6.16	6.10	8.67	11.23
50th-Percentile Queue Length [ft/ln]	327.24	313.72	205.82	153.99	152.53	216.79	280.82
95th-Percentile Queue Length [veh/ln]	19.02	18.36	12.94	10.23	10.15	13.50	16.73
95th-Percentile Queue Length [ft/ln]	475.57	458.96	323.46	255.74	253.80	337.52	418.23

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	38.10	40.89	44.60	46.17	12.28	12.33	75.31	75.31	75.31	35.08	35.08	35.08
Movement LOS	D	D	D	D	B	B	E	E	E	D	D	D
d_A, Approach Delay [s/veh]	41.15			20.23			75.31			35.08		
Approach LOS	D			C			E			D		
d_I, Intersection Delay [s/veh]	33.57											
Intersection LOS	C											
Intersection V/C	1.000											

Emissions

Vehicle Miles Traveled [mph]	362.20	321.22	53.68	88.26	86.91	19.51	12.24
Stops [stops/h]	523.58	501.96	329.31	246.38	244.04	346.86	449.31
Fuel consumption [US gal/h]	22.24	20.60	7.74	6.62	6.54	6.05	6.67
CO [g/h]	1554.64	1440.18	540.72	462.51	457.00	423.19	466.25
NOx [g/h]	302.48	280.21	105.20	89.99	88.92	82.34	90.72
VOC [g/h]	360.30	333.77	125.32	107.19	105.92	98.08	108.06

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	28.9
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	20.74
l_p,int, Pedestrian LOS Score for Intersectio	2.745	3.289	1.864	2.172
Crosswalk LOS	B	C	A	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	642	1131	651	651
d_b, Bicycle Delay [s]	20.75	8.50	20.50	20.49
l_b,int, Bicycle LOS Score for Intersection	2.451	2.762	1.974	2.411
Bicycle LOS	B	C	A	B

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	56.2
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.733

Intersection Setup

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	245	187	64	88	244	55	25	476	118	20	483	41
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	17	0	0	5	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	245	187	64	88	244	55	25	493	118	20	488	41
Peak Hour Factor	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375	0.9375
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	65	50	17	23	65	15	7	131	31	5	130	11
Total Analysis Volume [veh/h]	261	199	68	94	260	59	27	526	126	21	521	44
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	18			18			18			19		
v_di, Inbound Pedestrian Volume crossing m	19			18			18			18		
v_co, Outbound Pedestrian Volume crossing	26			21			25			20		
v_ci, Inbound Pedestrian Volume crossing mi	25			20			26			21		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	11			37			52			17		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	110
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	26	30	26	30	26	20	71	71	20	71	71
Amber [s]	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	28	28	28	28	28	28	10	44	44	10	44	44
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	5	4	4	5	5	5
Vehicle Extension [s]	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	Yes		No	Yes	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	149	149	149	149	149	149	149	149
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	0.00	2.70	0.00	2.70
g_i, Effective Green Time [s]	26	26	30	30	79	71	79	71
g / C, Green / Cycle	0.17	0.17	0.20	0.20	0.53	0.48	0.53	0.48
(v / s)_i Volume / Saturation Flow Rate	0.15	0.16	0.05	0.18	0.03	0.37	0.02	0.31
s, saturation flow rate [veh/h]	1781	1707	1781	1769	919	1760	853	1831
c, Capacity [veh/h]	310	297	358	355	359	843	282	871
d1, Uniform Delay [s]	59.66	60.36	50.32	58.15	21.05	32.23	24.03	29.69
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	23.25	31.65	1.78	27.73	0.41	6.85	0.11	3.73
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.84	0.90	0.26	0.90	0.08	0.77	0.07	0.65
d, Delay for Lane Group [s/veh]	82.90	92.01	52.10	85.88	21.45	39.08	24.14	33.43
Lane Group LOS	F	F	D	F	C	D	C	C
Critical Lane Group	No	Yes	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	11.59	12.54	3.20	14.59	0.50	20.99	0.36	16.30
50th-Percentile Queue Length [ft/ln]	289.74	313.38	80.01	364.83	12.38	524.73	9.03	407.58
95th-Percentile Queue Length [veh/ln]	17.17	18.34	5.76	20.86	0.89	28.50	0.65	22.92
95th-Percentile Queue Length [ft/ln]	429.31	458.54	144.01	521.46	22.29	712.56	16.25	573.12

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	82.90	92.01	92.01	52.10	85.88	85.88	21.45	39.08	39.08	24.14	33.43	33.43
Movement LOS	F	F	F	D	F	F	C	D	D	C	C	C
d_A, Approach Delay [s/veh]	87.51			78.20			38.38			33.09		
Approach LOS	F			E			D			C		
d_I, Intersection Delay [s/veh]	56.19											
Intersection LOS	E											
Intersection V/C	0.733											

Emissions

Vehicle Miles Traveled [mph]	6.18	6.33	2.23	7.56	6.41	154.75	7.89	212.18
Stops [stops/h]	279.57	302.39	77.20	352.04	11.95	506.32	8.71	393.28
Fuel consumption [US gal/h]	6.20	6.93	1.39	7.27	0.45	14.35	0.48	14.75
CO [g/h]	433.51	484.38	97.37	507.83	31.29	1003.28	33.27	1031.04
NOx [g/h]	84.34	94.24	18.94	98.80	6.09	195.20	6.47	200.60
VOC [g/h]	100.47	112.26	22.57	117.69	7.25	232.52	7.71	238.95

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	64.02	64.02	64.02	64.02
l_p,int, Pedestrian LOS Score for Intersectio	2.283	2.168	2.526	2.378
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	312	312	527	527
d_b, Bicycle Delay [s]	53.43	54.14	41.57	40.84
l_b,int, Bicycle LOS Score for Intersection	2.431	2.241	2.680	2.527
Bicycle LOS	B	B	B	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	61.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.826

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	176	1025	297	144	1133	69	153	395	83	436	256	110
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	11	6	0	0	0	0	0	3	0	2
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	176	1025	308	150	1133	69	153	395	83	439	256	112
Peak Hour Factor	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110	0.9110
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	48	281	85	41	311	19	42	108	23	120	70	31
Total Analysis Volume [veh/h]	193	1125	338	165	1244	76	168	434	91	482	281	123
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			10			0			10		
v_di, Inbound Pedestrian Volume crossing m	0			10			0			10		
v_co, Outbound Pedestrian Volume crossing	0			11			12			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			12			11			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			4			41			11		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	1.0	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	Yes	Yes		Yes	Yes			Yes			Yes	
Pedestrian Recall	No	Yes		No	Yes			No			Yes	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.00	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	1.00	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	17	60	60	24	67	67	24	24	29	29	29
g / C, Green / Cycle	0.11	0.40	0.40	0.16	0.45	0.45	0.16	0.16	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.11	0.32	0.22	0.09	0.35	0.05	0.19	0.20	0.14	0.15	0.08
s, saturation flow rate [veh/h]	1781	3560	1570	1781	3560	1512	1826	1748	3459	1870	1503
c, Capacity [veh/h]	202	1422	627	285	1588	675	292	280	669	362	291
d1, Uniform Delay [s]	63.30	30.02	25.93	50.62	14.80	10.92	63.00	63.00	56.71	57.43	52.90
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	52.87	4.58	3.31	8.32	3.94	0.34	117.36	129.40	6.60	15.10	4.47
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.96	0.79	0.54	0.58	0.78	0.11	1.20	1.23	0.72	0.78	0.42
d, Delay for Lane Group [s/veh]	116.17	34.59	29.24	58.94	18.74	11.26	180.36	192.40	63.31	72.53	57.37
Lane Group LOS	F	C	C	E	B	B	F	F	E	E	E
Critical Lane Group	Yes	No	No	No	Yes	No	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	10.01	15.81	7.81	5.66	9.07	0.78	20.70	20.74	9.22	11.68	4.46
50th-Percentile Queue Length [ft/ln]	250.20	395.20	195.25	141.42	226.86	19.57	517.41	518.57	230.44	291.94	111.43
95th-Percentile Queue Length [veh/ln]	15.20	22.33	12.39	9.56	14.01	1.41	30.65	31.00	14.20	17.28	7.92
95th-Percentile Queue Length [ft/ln]	379.91	558.22	309.83	238.93	350.37	35.22	766.34	775.02	354.92	432.04	197.99

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	116.17	34.59	29.24	58.94	18.74	11.26	180.36	187.35	192.40	63.31	72.53	57.37
Movement LOS	F	C	C	E	B	B	F	F	F	E	E	E
d_A, Approach Delay [s/veh]	43.01			22.82			186.32			65.41		
Approach LOS	D			C			F			E		
d_I, Intersection Delay [s/veh]	61.90											
Intersection LOS	E											
Intersection V/C	0.826											

Emissions

Vehicle Miles Traveled [mph]	4.58	26.67	8.01	3.91	29.49	1.80	8.28	8.12	114.40	66.70	29.19
Stops [stops/h]	240.19	758.79	187.44	135.76	435.57	18.78	496.71	497.82	442.45	280.26	106.97
Fuel consumption [US gal/h]	6.54	14.64	3.73	3.15	9.14	0.38	15.93	16.51	13.36	8.44	3.23
CO [g/h]	457.33	1023.47	260.45	220.11	639.11	26.85	1113.45	1154.09	934.08	590.03	225.68
NOx [g/h]	88.98	199.13	50.67	42.83	124.35	5.22	216.64	224.54	181.74	114.80	43.91
VOC [g/h]	105.99	237.20	60.36	51.01	148.12	6.22	258.05	267.47	216.48	136.75	52.30

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.028	2.367	2.772
Crosswalk LOS	F	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.53	25.34	54.89	52.37
l_b,int, Bicycle LOS Score for Intersection	2.926	2.785	2.131	3.022
Bicycle LOS	C	C	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	41.1
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.901

Intersection Setup

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

Volumes

Name	Middlefield Road		Middlefield Road		Ravenswood Avenue	
Base Volume Input [veh/h]	391	517	410	147	151	488
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	5	8	28	0	0	17
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	396	525	438	147	151	505
Peak Hour Factor	0.8988	0.8988	0.8988	0.8988	0.8988	0.8988
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	110	146	122	41	42	140
Total Analysis Volume [veh/h]	441	584	487	164	168	562
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	11		0		10	
v_di, Inbound Pedestrian Volume crossing m	10		0		11	
v_co, Outbound Pedestrian Volume crossing	0		1		1	
v_ci, Inbound Pedestrian Volume crossing mi	0		1		1	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	39		37		22	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	44	35	70	0	33	44
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	18	18	0	10	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	48	93	45	0	37	48
Lead / Lag	Lead	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	3.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	No	Yes		Yes	No
Pedestrian Recall	No	Yes	Yes		No	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	4.60	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	2.60	0.00	0.00
g_i, Effective Green Time [s]	39	91	48	35	76
g / C, Green / Cycle	0.30	0.70	0.37	0.27	0.58
(v / s)_i Volume / Saturation Flow Rate	0.25	0.31	0.37	0.09	0.36
s, saturation flow rate [veh/h]	1781	1870	1759	1781	1574
c, Capacity [veh/h]	529	1310	646	479	885
d1, Uniform Delay [s]	42.69	8.46	41.11	38.33	19.26
k, delay calibration	0.30	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.02	1.10	37.13	2.01	3.47
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.83	0.45	1.01	0.35	0.64
d, Delay for Lane Group [s/veh]	51.71	9.56	78.24	40.34	22.73
Lane Group LOS	D	A	F	D	C
Critical Lane Group	Yes	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	14.39	6.93	26.82	4.63	12.09
50th-Percentile Queue Length [ft/ln]	359.66	173.37	670.60	115.70	302.28
95th-Percentile Queue Length [veh/ln]	20.61	11.25	35.50	8.16	17.79
95th-Percentile Queue Length [ft/ln]	515.17	281.34	887.48	203.90	444.84

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	51.71	9.56	78.24	78.24	40.34	22.73
Movement LOS	D	A	E	E	D	C
d_A, Approach Delay [s/veh]	27.70		78.24		26.78	
Approach LOS	C		E		C	
d_I, Intersection Delay [s/veh]	41.09					
Intersection LOS	D					
Intersection V/C	0.901					

Emissions

Vehicle Miles Traveled [mph]	42.25	55.95	684.38	63.09	211.05
Stops [stops/h]	398.39	192.04	742.82	128.16	334.83
Fuel consumption [US gal/h]	9.25	4.71	42.04	4.68	13.14
CO [g/h]	646.37	329.46	2938.33	327.42	918.28
NOx [g/h]	125.76	64.10	571.69	63.70	178.66
VOC [g/h]	149.80	76.36	680.99	75.88	212.82

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	56.31	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.740	0.000	2.392
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1362	623	500
d_b, Bicycle Delay [s]	6.76	31.39	36.97
l_b,int, Bicycle LOS Score for Intersection	3.251	2.634	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	52.2
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.630

Intersection Setup

Name				Middlefield Road			D Street			Ringwood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name				Middlefield Road			D Street			Ringwood Avenue		
Base Volume Input [veh/h]	113	611	230	281	577	44	10	18	2	146	75	328
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	13	0	0	45	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	113	624	230	281	622	44	10	18	2	146	75	328
Peak Hour Factor	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984	0.8984
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	31	174	64	78	173	12	3	5	1	41	21	91
Total Analysis Volume [veh/h]	126	695	256	313	692	49	11	20	2	163	83	365
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			6			1			5		
v_di, Inbound Pedestrian Volume crossing m	1			5			2			6		
v_co, Outbound Pedestrian Volume crossing	40			8			9			41		
v_ci, Inbound Pedestrian Volume crossing mi	41			9			8			40		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	15			38			8			23		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	47.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	28	62	25	22	57	0	62	25	62	57	25	57
Amber [s]	3.5	3.5	3.5	3.0	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.5	2.6	0.0	0.0	0.0	0.0	2.6	0.0	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	9	55	38	37	83	0	55	38	55	83	38	83
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	3.0	3.6	2.9	3.0	3.6	0.0	3.6	2.9	3.6	3.6	2.9	3.6
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	131	131	131	131	131	131	131	131	131	131
L, Total Lost Time per Cycle [s]	4.50	4.60	4.60	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.50	2.60	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	5	61	61	27	82	82	35	35	35	35
g / C, Green / Cycle	0.04	0.46	0.46	0.20	0.63	0.63	0.27	0.27	0.27	0.27
(v / s)_i Volume / Saturation Flow Rate	0.07	0.20	0.18	0.18	0.20	0.20	0.01	0.01	0.17	0.24
s, saturation flow rate [veh/h]	1781	3560	1404	1781	1870	1811	938	1836	1409	1521
c, Capacity [veh/h]	68	1650	651	365	1181	1144	139	488	420	404
d1, Uniform Delay [s]	62.76	23.34	22.39	50.05	11.07	11.10	54.76	35.61	44.13	45.67
k, delay calibration	0.11	0.50	0.50	0.26	0.50	0.50	0.10	0.10	0.14	0.30
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	395.60	0.79	1.78	12.92	0.71	0.74	0.23	0.04	1.62	17.53
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.85	0.42	0.39	0.86	0.32	0.32	0.08	0.05	0.59	0.90
d, Delay for Lane Group [s/veh]	458.36	24.13	24.17	62.97	11.78	11.84	54.98	35.65	45.75	63.20
Lane Group LOS	F	C	C	E	B	B	D	D	D	E
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	9.74	7.33	5.37	11.08	5.03	4.94	0.35	0.54	7.36	13.21
50th-Percentile Queue Length [ft/ln]	243.41	183.20	134.32	276.98	125.83	123.43	8.73	13.59	184.01	330.32
95th-Percentile Queue Length [veh/ln]	16.69	11.77	9.17	16.54	8.71	8.58	0.63	0.98	11.81	19.17
95th-Percentile Queue Length [ft/ln]	417.18	294.19	229.35	413.45	217.81	214.53	15.71	24.45	295.24	479.36

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	458.36	24.13	24.17	62.97	11.81	11.84	54.98	35.65	35.65	45.75	45.75	63.20
Movement LOS	F	C	C	E	B	B	D	D	D	D	D	E
d_A, Approach Delay [s/veh]	74.94			27.00			42.09			56.18		
Approach LOS	E			C			D			E		
d_I, Intersection Delay [s/veh]	52.21											
Intersection LOS	D											
Intersection V/C	0.630											

Emissions

Vehicle Miles Traveled [mph]	41.56	229.24	84.44	29.99	35.91	35.08	0.81	1.61	5.82	8.64
Stops [stops/h]	268.59	404.30	148.21	305.63	138.85	136.19	9.63	14.99	203.04	364.49
Fuel consumption [US gal/h]	14.94	15.08	5.55	7.45	3.31	3.24	0.19	0.28	3.65	7.06
CO [g/h]	1044.65	1054.35	388.24	520.90	231.46	226.74	13.04	19.30	255.24	493.72
NOx [g/h]	203.25	205.14	75.54	101.35	45.03	44.11	2.54	3.76	49.66	96.06
VOC [g/h]	242.11	244.35	89.98	120.72	53.64	52.55	3.02	4.47	59.15	114.42

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.71	54.71	54.71	54.71
l_p,int, Pedestrian LOS Score for Intersectio	3.017	2.817	2.021	2.348
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	774	1203	513	513
d_b, Bicycle Delay [s]	24.71	10.56	36.19	36.47
l_b,int, Bicycle LOS Score for Intersection	2.448	2.429	1.614	2.568
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	60.2
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.786

Intersection Setup

Name	Middlefield Road						Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	1	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Volumes

Name	Middlefield Road						Willow Road			Willow Road		
Base Volume Input [veh/h]	163	362	245	276	313	24	35	284	127	381	228	436
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	6	0	18	2	0	0	0	0	0	0	63
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	1000	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	163	368	245	294	315	24	35	284	127	381	228	499
Peak Hour Factor	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562	0.9562
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	43	96	64	77	82	6	9	74	33	100	60	130
Total Analysis Volume [veh/h]	170	385	256	307	329	25	37	297	133	398	238	522
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			2			10			2		
v_di, Inbound Pedestrian Volume crossing m	10			2			10			2		
v_co, Outbound Pedestrian Volume crossing	2			5			5			3		
v_ci, Inbound Pedestrian Volume crossing mi	3			5			5			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	6			7			17			17		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split	Split
Signal Group	6	3	6	2	2	2	8	1	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	0	0	0	0	0	0	0	0	0	0	0
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	3.7	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	8	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	22	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	2.7	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	20.0	20.0	20.0	0.0	20.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	32	0	39	39	39	0	33	0	46	46	46
Lead / Lag	-	-	-	Lag	-	-	-	-	-	Lag	-	-
Minimum Green [s]	0	3	0	3	3	3	0	3	0	3	3	3
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	22	22	22	22	23	23	23	27	27	27	61	61	61
g / C, Green / Cycle	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.18	0.18	0.18	0.40	0.40	0.40
(v / s)_i Volume / Saturation Flow Rate	0.10	0.12	0.12	0.13	0.12	0.12	0.12	0.02	0.16	0.09	0.18	0.17	0.34
s, saturation flow rate [veh/h]	1781	1870	1762	1533	1781	1833	1816	1781	1870	1486	1781	1847	1556
c, Capacity [veh/h]	260	273	257	224	268	276	273	316	332	264	719	745	628
d1, Uniform Delay [s]	60.48	62.32	62.43	62.35	61.63	61.61	61.69	51.83	60.33	55.38	32.47	32.22	39.72
k, delay calibration	0.11	0.19	0.20	0.21	0.11	0.11	0.11	0.11	0.32	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.78	11.38	13.11	17.78	5.75	5.52	5.83	0.16	20.57	1.49	1.97	1.78	12.18
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.65	0.84	0.85	0.87	0.81	0.81	0.81	0.12	0.90	0.50	0.44	0.43	0.83
d, Delay for Lane Group [s/veh]	63.26	73.70	75.53	80.13	67.38	67.13	67.52	51.99	80.90	56.88	34.44	34.01	51.90
Lane Group LOS	E	E	E	F	E	E	E	D	F	E	C	C	D
Critical Lane Group	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	6.35	9.37	9.07	8.37	8.45	8.65	8.68	1.20	12.98	4.67	8.98	8.89	19.36
50th-Percentile Queue Length [ft/ln]	158.7	234.2	226.6	209.2	211.16	216.19	217.04	30.01	324.50	116.65	224.39	222.14	483.88
95th-Percentile Queue Length [veh/ln]	10.48	14.39	14.00	13.11	13.21	13.47	13.51	2.16	18.89	8.21	13.89	13.77	26.57
95th-Percentile Queue Length [ft/ln]	262.0	359.7	350.0	327.8	330.32	336.76	337.84	54.02	472.21	205.21	347.22	344.35	664.26

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	63.26	74.45	79.30	67.31	67.36	67.52	51.99	80.90	56.88	34.36	34.01	51.90
Movement LOS	E	E	E	E	E	E	D	F	E	C	C	D
d_A, Approach Delay [s/veh]	73.55			67.34			71.77			42.19		
Approach LOS	E			E			E			D		
d_I, Intersection Delay [s/veh]	60.23											
Intersection LOS	E											
Intersection V/C	0.786											

Emissions

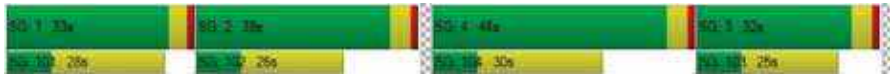
Vehicle Miles Traveled [mph]	4.03	5.41	5.16	4.62	67.37	69.13	69.16	0.88	7.03	3.15	135.18	135.18	221.89
Stops [stops/h]	152.3	224.8	217.5	200.8	202.72	207.55	208.36	28.81	311.52	111.98	215.41	213.25	464.52
Fuel consumption [US gal/h]	3.20	4.89	4.76	4.48	6.86	7.03	7.05	0.59	6.90	2.29	9.13	9.10	17.27
CO [g/h]	223.3	341.7	332.8	312.9	479.66	491.21	492.93	41.01	482.29	159.90	638.46	635.91	1207.38
NOx [g/h]	43.46	66.49	64.77	60.89	93.32	95.57	95.91	7.98	93.84	31.11	124.22	123.72	234.91
VOC [g/h]	51.77	79.20	77.15	72.53	111.16	113.84	114.24	9.50	111.78	37.06	147.97	147.38	279.82

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.48	63.48	63.48	63.48
l_p,int, Pedestrian LOS Score for Intersectio	4.333	2.637	2.374	2.814
Crosswalk LOS	E	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	457	383	551
d_b, Bicycle Delay [s]	50.34	44.78	49.47	39.72
l_b,int, Bicycle LOS Score for Intersection	3.054	2.105	2.330	3.470
Bicycle LOS	C	B	B	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	17.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.736

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	147	112	114	49	98	12	4	676	158	35	907	10
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	18	0	0	63	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	147	112	114	49	98	12	4	694	158	35	970	10
Peak Hour Factor	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712	0.9712
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	38	29	29	13	25	3	1	179	41	9	250	3
Total Analysis Volume [veh/h]	151	115	117	50	101	12	4	715	163	36	999	10
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	3			6			6			4		
v_di, Inbound Pedestrian Volume crossing m	4			6			6			3		
v_co, Outbound Pedestrian Volume crossing	1			3			0			2		
v_ci, Inbound Pedestrian Volume crossing mi	0			2			1			3		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	13			7			28			32		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	68.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	26	0	26	26	26	64	64	64	64	64	64
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	90	90	90	90	90	90	90	90
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	19	19	19	19	62	62	62	62
g / C, Green / Cycle	0.21	0.21	0.21	0.21	0.69	0.69	0.69	0.69
(v / s)_i Volume / Saturation Flow Rate	0.12	0.14	0.04	0.06	0.01	0.49	0.06	0.54
s, saturation flow rate [veh/h]	1254	1684	1143	1822	558	1797	632	1866
c, Capacity [veh/h]	265	362	171	391	243	1247	313	1295
d1, Uniform Delay [s]	37.15	32.18	39.85	29.58	22.71	8.23	18.98	9.17
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.91	1.90	0.93	0.40	0.12	3.35	0.74	4.68
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.57	0.64	0.29	0.29	0.02	0.70	0.11	0.78
d, Delay for Lane Group [s/veh]	39.06	34.08	40.78	29.99	22.83	11.58	19.72	13.85
Lane Group LOS	D	C	D	C	C	B	B	B
Critical Lane Group	No	Yes	No	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.34	4.76	1.11	2.09	0.07	9.73	0.57	12.65
50th-Percentile Queue Length [ft/ln]	83.53	118.93	27.71	52.21	1.72	243.26	14.13	316.26
95th-Percentile Queue Length [veh/ln]	6.01	8.33	1.99	3.76	0.12	14.85	1.02	18.48
95th-Percentile Queue Length [ft/ln]	150.36	208.36	49.87	93.97	3.10	371.16	25.44	462.08

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	39.06	34.08	34.08	40.78	29.99	29.99	22.83	11.58	11.58	19.72	13.85	13.85
Movement LOS	D	C	C	D	C	C	C	B	B	B	B	B
d_A, Approach Delay [s/veh]	36.04			33.30			11.63			14.05		
Approach LOS	D			C			B			B		
d_I, Intersection Delay [s/veh]	17.86											
Intersection LOS	B											
Intersection V/C	0.736											

Emissions

Vehicle Miles Traveled [mph]	10.81	16.61	4.33	9.79	1.70	373.22	3.58	100.30
Stops [stops/h]	133.65	190.29	44.33	83.53	2.76	389.22	22.61	506.01
Fuel consumption [US gal/h]	2.20	3.09	0.78	1.45	0.11	20.35	0.39	9.30
CO [g/h]	153.72	215.72	54.50	101.35	7.38	1422.22	27.41	649.74
NOx [g/h]	29.91	41.97	10.60	19.72	1.44	276.71	5.33	126.42
VOC [g/h]	35.63	50.00	12.63	23.49	1.71	329.61	6.35	150.58

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
l_p,int, Pedestrian LOS Score for Intersectio	2.176	2.024	2.708	2.593
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	487	487	1331	1331
d_b, Bicycle Delay [s]	25.93	25.85	5.10	5.12
l_b,int, Bicycle LOS Score for Intersection	2.192	1.829	3.015	3.284
Bicycle LOS	B	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	27.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.919

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	4	7	4	252	4	46	34	769	5	5	911	184
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	18	0	0	63	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	7	4	252	4	46	34	787	5	5	974	184
Peak Hour Factor	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896	0.9896
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	2	1	64	1	12	9	199	1	1	246	46
Total Analysis Volume [veh/h]	4	7	4	255	4	46	34	795	5	5	984	186
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	5			2			4			2		
v_di, Inbound Pedestrian Volume crossing m	4			2			5			2		
v_co, Outbound Pedestrian Volume crossing	20			8			8			20		
v_ci, Inbound Pedestrian Volume crossing mi	20			8			8			20		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	7			13			9			59		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	30.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	36	0	36	36	36	94	94	94	94	94	94
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			Yes			Yes	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	30	30	92	92	92	92
g / C, Green / Cycle	0.23	0.23	0.70	0.70	0.70	0.70
(v / s)_i Volume / Saturation Flow Rate	0.01	0.22	0.07	0.43	0.01	0.65
s, saturation flow rate [veh/h]	1755	1389	480	1867	680	1800
c, Capacity [veh/h]	442	373	131	1316	369	1269
d1, Uniform Delay [s]	38.67	48.82	49.59	9.90	19.02	16.17
k, delay calibration	0.11	0.37	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.03	13.85	4.73	2.09	0.07	12.38
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.03	0.82	0.26	0.61	0.01	0.92
d, Delay for Lane Group [s/veh]	38.70	62.67	54.32	12.00	19.09	28.55
Lane Group LOS	D	E	D	B	B	C
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.38	11.13	1.19	11.97	0.09	30.36
50th-Percentile Queue Length [ft/ln]	9.58	278.31	29.70	299.21	2.26	758.95
95th-Percentile Queue Length [veh/ln]	0.69	16.60	2.14	17.64	0.16	39.39
95th-Percentile Queue Length [ft/ln]	17.24	415.10	53.46	441.05	4.07	984.85

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	38.70	38.70	38.70	62.67	62.67	62.67	54.32	12.00	12.00	19.09	28.55	28.55
Movement LOS	D	D	D	E	E	E	D	B	B	B	C	C
d_A, Approach Delay [s/veh]	38.70			62.67			13.72			28.51		
Approach LOS	D			E			B			C		
d_I, Intersection Delay [s/veh]	27.75											
Intersection LOS	C											
Intersection V/C	0.919											

Emissions

Vehicle Miles Traveled [mph]	0.42		7.24		3.38	79.52	1.47	344.19
Stops [stops/h]	10.61		308.28		32.90	331.43	2.50	840.68
Fuel consumption [US gal/h]	0.18		5.89		0.65	6.80	0.09	25.61
CO [g/h]	12.44		411.73		45.72	475.35	6.56	1790.20
NOx [g/h]	2.42		80.11		8.89	92.49	1.28	348.31
VOC [g/h]	2.88		95.42		10.59	110.17	1.52	414.90

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
l_p,int, Pedestrian LOS Score for Intersectio	1.751	2.040	2.469	3.055
Crosswalk LOS	A	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	491	491	1383	1383
d_b, Bicycle Delay [s]	37.14	37.26	6.21	6.37
l_b,int, Bicycle LOS Score for Intersection	1.584	2.063	2.936	3.498
Bicycle LOS	A	B	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	125.4
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.168

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	73	6	344	67	10	24	19	1123	7	36	1006	56
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	18	0	0	63	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	73	6	344	67	10	24	19	1141	7	36	1069	56
Peak Hour Factor	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709	0.9709
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	2	89	17	3	6	5	294	2	9	275	14
Total Analysis Volume [veh/h]	75	6	354	69	10	25	20	1175	7	37	1101	58
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	9			3			8			3		
v_di, Inbound Pedestrian Volume crossing m	8			3			9			3		
v_co, Outbound Pedestrian Volume crossing	4			11			11			4		
v_ci, Inbound Pedestrian Volume crossing mi	4			11			11			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			3			4		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	165	165	165	165	165	165	165	165	165	165
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	30	30	13	13	13	3	96	96	7	100
g / C, Green / Cycle	0.18	0.18	0.08	0.08	0.08	0.02	0.58	0.58	0.04	0.61
(v / s)_i Volume / Saturation Flow Rate	0.08	0.30	0.03	0.03	0.02	0.02	0.36	0.36	0.04	0.76
s, saturation flow rate [veh/h]	937	1181	937	1368	1342	937	1422	1866	937	1529
c, Capacity [veh/h]	170	215	77	112	110	20	831	1090	40	927
d1, Uniform Delay [s]	60.00	67.47	72.01	72.00	70.65	80.74	22.26	22.27	78.62	32.47
k, delay calibration	0.11	0.50	0.11	0.11	0.11	0.11	0.27	0.27	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.78	323.89	3.64	2.48	1.04	99.67	1.87	1.43	46.99	121.52
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.44	1.68	0.42	0.42	0.23	1.02	0.62	0.62	0.92	1.25
d, Delay for Lane Group [s/veh]	61.77	391.35	75.65	74.47	71.69	180.41	24.13	23.70	125.61	153.99
Lane Group LOS	E	F	E	E	E	F	C	C	F	F
Critical Lane Group	No	Yes	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.92	28.45	1.41	2.02	1.05	1.38	13.30	17.33	2.11	67.42
50th-Percentile Queue Length [ft/ln]	73.00	711.28	35.37	50.42	26.23	34.61	332.57	433.33	52.81	1685.49
95th-Percentile Queue Length [veh/ln]	5.26	45.32	2.55	3.63	1.89	2.49	19.28	24.16	3.80	96.09
95th-Percentile Queue Length [ft/ln]	131.40	1133.07	63.66	90.75	47.22	62.30	482.11	604.03	95.07	2402.22

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	61.77	391.35	391.35	75.04	74.47	71.69	180.41	23.89	23.70	125.61	153.99	153.99
Movement LOS	E	F	F	E	E	E	F	C	C	F	F	F
d_A, Approach Delay [s/veh]	334.53			74.17			26.49			153.11		
Approach LOS	F			E			C			F		
d_I, Intersection Delay [s/veh]	125.37											
Intersection LOS	F											
Intersection V/C	1.168											

Emissions

Vehicle Miles Traveled [mph]	3.58	17.17	1.24	1.79	0.96	5.88	150.36	197.36	5.05	158.08
Stops [stops/h]	63.79	621.55	30.91	44.06	22.92	30.25	290.61	378.67	46.15	1472.85
Fuel consumption [US gal/h]	1.35	31.82	0.59	0.84	0.44	1.14	10.31	13.45	1.35	49.07
CO [g/h]	94.25	2224.24	41.27	59.06	30.56	79.93	720.34	940.32	94.34	3430.05
NOx [g/h]	18.34	432.76	8.03	11.49	5.95	15.55	140.15	182.95	18.35	667.36
VOC [g/h]	21.84	515.49	9.56	13.69	7.08	18.52	166.95	217.93	21.86	794.95

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	71.76	71.76	71.76	71.76
I_p,int, Pedestrian LOS Score for Intersectio	2.101	2.175	2.745	2.860
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	364	364	243	243
d_b, Bicycle Delay [s]	55.15	55.15	63.70	63.74
I_b,int, Bicycle LOS Score for Intersection	2.277	1.731	2.551	3.533
Bicycle LOS	B	A	B	D

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	144.6
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.254

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	393	58	105	1406	1228	660
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	18	63	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	393	58	105	1424	1291	660
Peak Hour Factor	0.9360	0.9360	0.9360	0.9360	0.9360	0.9360
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	15	28	380	345	176
Total Analysis Volume [veh/h]	420	62	112	1521	1379	705
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	4		0		4	
v_ci, Inbound Pedestrian Volume crossing mi	4		0		4	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	1		11		2	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	18	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	20	12	60	48	48
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	95	95	95	95	95	95
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	36	36	9	49	36	36
g / C, Green / Cycle	0.38	0.38	0.10	0.52	0.38	0.38
(v / s)_i Volume / Saturation Flow Rate	0.45	0.04	0.09	0.58	0.49	0.57
s, saturation flow rate [veh/h]	937	1569	1312	2623	2792	1227
c, Capacity [veh/h]	356	596	130	1358	1064	468
d1, Uniform Delay [s]	29.30	18.91	41.88	22.79	29.23	28.84
k, delay calibration	0.50	0.04	0.04	0.29	0.22	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	106.24	0.03	6.13	60.44	136.31	239.18
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.18	0.10	0.86	1.12	1.30	1.51
d, Delay for Lane Group [s/veh]	135.53	18.94	48.01	83.23	165.54	268.02
Lane Group LOS	F	B	D	F	F	F
Critical Lane Group	Yes	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	18.19	0.87	2.76	25.18	31.45	40.89
50th-Percentile Queue Length [ft/ln]	454.87	21.73	69.12	629.48	786.37	1022.15
95th-Percentile Queue Length [veh/ln]	27.89	1.56	4.98	36.33	47.56	64.18
95th-Percentile Queue Length [ft/ln]	697.25	39.11	124.42	908.33	1188.89	1604.39

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	135.53	18.94	48.01	83.23	165.54	268.02
Movement LOS	F	B	D	F	F	F
d_A, Approach Delay [s/veh]	120.54		80.82		200.21	
Approach LOS	F		F		F	
d_I, Intersection Delay [s/veh]	144.63					
Intersection LOS	F					
Intersection V/C	1.254					

Emissions

Vehicle Miles Traveled [mph]	9.95	1.47	15.28	207.45	161.85	82.74
Stops [stops/h]	692.69	33.09	105.26	1917.22	2395.06	1556.59
Fuel consumption [US gal/h]	15.82	0.48	2.30	44.89	70.63	53.31
CO [g/h]	1105.72	33.70	161.09	3137.87	4936.96	3726.07
NOx [g/h]	215.13	6.56	31.34	610.52	960.55	724.96
VOC [g/h]	256.26	7.81	37.34	727.23	1144.19	863.55

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	36.92	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.364	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	334	1153	899
d_b, Bicycle Delay [s]	32.82	8.53	14.34
l_b,int, Bicycle LOS Score for Intersection	1.560	2.907	3.279
Bicycle LOS	A	C	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	136.8
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	2.031

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	922	0	283	0	1091	593	0	1646	1219	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	6	0	8	10	0	57	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	922	0	289	0	1099	603	0	1703	1219	0	0	0
Peak Hour Factor	0.9611	1.0000	0.9611	1.0000	0.9611	0.9611	1.0000	0.9611	0.9611	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	240	0	75	0	286	157	0	443	317	0	0	0
Total Analysis Volume [veh/h]	959	0	301	0	1143	627	0	1772	1268	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			9			0			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
I1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	23	0	0	0	57	0	0	57	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	4	0	0	4	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				No			No				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	80	80	80	80	80	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	19	19	53	53	53	
g / C, Green / Cycle	0.24	0.24	0.66	0.66	0.66	
(v / s)_i Volume / Saturation Flow Rate	0.28	0.11	0.22	0.35	1.35	
s, saturation flow rate [veh/h]	3459	2813	5094	5094	941	
c, Capacity [veh/h]	821	668	3375	3375	624	
d1, Uniform Delay [s]	30.50	26.04	5.87	6.99	13.50	
k, delay calibration	0.11	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	78.54	0.48	0.27	0.59	470.76	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	1.17	0.45	0.34	0.53	2.03	
d, Delay for Lane Group [s/veh]	109.04	26.52	6.15	7.57	484.26	
Lane Group LOS	F	C	A	A	F	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	16.53	2.41	2.35	4.36	90.06	
50th-Percentile Queue Length [ft/ln]	413.35	60.34	58.82	109.11	2251.53	
95th-Percentile Queue Length [veh/ln]	25.18	4.34	4.23	7.79	152.02	
95th-Percentile Queue Length [ft/ln]	629.53	108.62	105.87	194.77	3800.55	

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	109.04	0.00	26.52	0.00	6.15	0.00	0.00	7.57	484.26	0.00	0.00	0.00
Movement LOS	F		C		A			A	F			
d_A, Approach Delay [s/veh]	89.33			4.02			206.40			0.00		
Approach LOS	F			A			F			A		
d_I, Intersection Delay [s/veh]	136.80											
Intersection LOS	F											
Intersection V/C	2.031											

Emissions

Vehicle Miles Traveled [mph]	22.74	7.14	134.15	176.31	126.16	
Stops [stops/h]	1488.05	217.24	317.61	589.21	4052.75	
Fuel consumption [US gal/h]	30.43	3.12	8.71	13.25	152.51	
CO [g/h]	2127.40	217.97	608.65	925.85	10660.78	
NOx [g/h]	413.91	42.41	118.42	180.14	2074.20	
VOC [g/h]	493.05	50.52	141.06	214.57	2470.74	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	31.51	0.00	31.51
I_p,int, Pedestrian LOS Score for Intersectio	0.000	3.038	0.000	1.419
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	475	1325	1325	0
d_b, Bicycle Delay [s]	23.26	4.58	4.56	40.00
I_b,int, Bicycle LOS Score for Intersection	1.560	2.188	3.232	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	90.3
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.218

Intersection Setup

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

Volumes

Name	US-101 NB Ramps						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	512	0	1185	0	0	0	0	1429	486	0	2353	534
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	34	0	0	0	0	0	0	6	2	0	23	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	546	0	1185	0	0	0	0	1435	488	0	2376	534
Peak Hour Factor	0.9889	1.0000	0.9889	0.9889	0.9889	0.9889	1.0000	0.9889	0.9889	1.0000	0.9889	0.9889
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	138	0	300	0	0	0	0	363	123	0	601	135
Total Analysis Volume [veh/h]	552	0	1198	0	0	0	0	1451	493	0	2403	540
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			7		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	80
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	7	0	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	30	0	0	50	0	0	58	0
Amber [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	5	0	5	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	10	0	10	0	10	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No			No	
I1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	0	10	0	20	0	0	50	0	0	50	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	5	0	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No		No			No			No	
Maximum Recall	No		No		No			No			No	
Pedestrian Recall	No		No		No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	C	C	C	R
C, Calculated Cycle Length [s]	80	80	80	80	80	80
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	16	26	16	46	56	46
g / C, Green / Cycle	0.20	0.33	0.20	0.58	0.70	0.58
(v / s)_i Volume / Saturation Flow Rate	0.20	0.43	0.00	0.28	0.85	0.63
s, saturation flow rate [veh/h]	2752	2813	1870	5094	2828	861
c, Capacity [veh/h]	572	914	419	2929	1980	495
d1, Uniform Delay [s]	32.11	27.00	0.00	10.10	12.00	16.45
k, delay calibration	0.11	0.13	0.11	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.13	141.78	0.00	0.60	101.08	67.36
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.97	1.31	0.00	0.50	1.21	1.09
d, Delay for Lane Group [s/veh]	43.24	168.78	0.00	10.70	113.08	83.81
Lane Group LOS	D	F	A	B	F	F
Critical Lane Group	No	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	6.03	26.21	0.00	4.60	26.85	16.66
50th-Percentile Queue Length [ft/ln]	150.87	655.28	0.00	115.00	671.28	416.48
95th-Percentile Queue Length [veh/ln]	10.06	40.26	0.00	8.12	40.96	24.91
95th-Percentile Queue Length [ft/ln]	251.59	1006.44	0.00	202.94	1023.96	622.75

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	43.24	0.00	168.78	0.00	0.00	0.00	0.00	10.70	0.00	0.00	113.08	83.81
Movement LOS	D		F	A	A	A		B			F	F
d_A, Approach Delay [s/veh]	129.18			0.00			8.01			107.71		
Approach LOS	F			A			A			F		
d_I, Intersection Delay [s/veh]	90.28											
Intersection LOS	F											
Intersection V/C	1.218											

Emissions

Vehicle Miles Traveled [mph]	13.09	28.40	0.00	144.37	56.79	12.76
Stops [stops/h]	543.12	2359.02	0.00	621.00	3624.90	749.66
Fuel consumption [US gal/h]	8.40	55.34	0.00	12.54	77.65	13.88
CO [g/h]	586.92	3868.51	0.00	876.23	5428.00	969.96
NOx [g/h]	114.19	752.67	0.00	170.48	1056.09	188.72
VOC [g/h]	136.02	896.56	0.00	203.07	1257.99	224.80

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	9.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	31.51	31.51	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.637	1.974	0.000	0.000
Crosswalk LOS	B	A	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	400	400	1150	1400
d_b, Bicycle Delay [s]	25.60	25.60	7.23	3.61
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	2.358	3.178
Bicycle LOS	A	A	B	C

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



333 Middlefield Road TIA

Vistro File: N:\...\MPA905-1.PM.vistro Scenario 26 Cumulative Plus Project PM
Report File: C:\...\CP PM.pdf 2/10/2026

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Marsh Road/101 NB Ramps	Signalized	HCM 7th Edition	WB Right	0.923	23.4	C
2	Marsh Rd (SR 84)/US 101 SB Offramp	Signalized	HCM 7th Edition	SB Thru	0.922	26.2	C
3	Marsh Rd/Rolison Rd-Scott Dr	Signalized	HCM 7th Edition	NB Left	0.842	31.0	C
4	Marsh Rd/Florence St-Bohannon Dr	Signalized	HCM 7th Edition	NB Left	0.888	47.5	D
5	Marsh Rd/Bay Rd	Signalized	HCM 7th Edition	SB Left	0.800	50.1	D
6	Ravenswood Ave/Laurel St	Signalized	HCM 7th Edition	EB Thru	0.784	68.8	E
7	El Camino Real (SR 82) /Ravenswood Ave-Menlo Ave	Signalized	HCM 7th Edition	NB Left	0.819	47.5	D
8	Middlefield Rd/Ravenswood Ave	Signalized	HCM 7th Edition	NB Left	0.715	32.1	C
9	Middlefield Rd/Ringwood Ave	Signalized	HCM 7th Edition	EB Left	0.722	39.4	D
10	Middlefield Rd-Willow Rd	Signalized	HCM 7th Edition	WB Right	0.828	63.5	E
11	Willow Rd/Gilbert Ave	Signalized	HCM 7th Edition	WB Left	0.873	35.9	D
12	Willow Rd/Coleman Ave	Signalized	HCM 7th Edition	EB Left	0.942	32.1	C
13	Willow Rd/Durham St-VA Med Entrance	Signalized	HCM 7th Edition	EB Left	0.779	24.4	C
14	Willow Rd/Bay Rd	Signalized	HCM 7th Edition	EB Left	0.925	21.0	C
15	Willow Rd/US-101 SB Ramps	Signalized	HCM 7th Edition	WB Right	1.376	73.2	E
16	Willow Rd/US-101 NB Ramps	Signalized	HCM 7th Edition	NB Right	1.193	185.8	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: Marsh Road/101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	23.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.923

Intersection Setup

Name	Marsh Road (SR 84)		Marsh Road		101 NB Ramps	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	1	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	500.00	360.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		Yes		Yes	

Volumes

Name	Marsh Road (SR 84)		Marsh Road		101 NB Ramps	
Base Volume Input [veh/h]	2152	0	0	1540	605	591
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	0.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2152	0	0	1540	605	591
Peak Hour Factor	0.9490	1.0000	1.0000	0.9490	0.9490	0.9490
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	567	0	0	406	159	156
Total Analysis Volume [veh/h]	2268	0	0	1623	638	623
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		1	
v_ci, Inbound Pedestrian Volume crossing mi	1		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		7		0	

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	40.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	2	0	0	6	8	1
Auxiliary Signal Groups						
Maximum Green [s]	100	0	0	100	100	0
Amber [s]	4.1	0.0	0.0	4.1	3.2	0.0
All red [s]	0.5	0.0	0.0	0.5	1.0	0.0
Walk [s]	7	0	0	10	5	0
Pedestrian Clearance [s]	12	0	0	10	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
l1, Start-Up Lost Time [s]	2.0	0.0	0.0	2.0	2.0	0.0
l2, Clearance Lost Time [s]	0.5	0.0	0.0	0.5	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	70	0	0	70	30	0
Lead / Lag	-	-	-	-	Lag	-
Minimum Green [s]	8	0	0	8	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall	Yes			Yes	No	
Maximum Recall	No			No	Yes	
Pedestrian Recall	No			No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	2.50	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.50	0.50	0.00	0.00
g_i, Effective Green Time [s]	68	68	28	28
g / C, Green / Cycle	0.68	0.68	0.28	0.28
(v / s)_i Volume / Saturation Flow Rate	0.64	0.46	0.18	0.22
s, saturation flow rate [veh/h]	3560	3560	3459	2813
c, Capacity [veh/h]	2403	2403	968	788
d1, Uniform Delay [s]	14.55	9.71	31.78	33.29
k, delay calibration	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.21	1.54	3.51	7.97
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.94	0.68	0.66	0.79
d, Delay for Lane Group [s/veh]	23.76	11.25	35.29	41.26
Lane Group LOS	C	B	D	D
Critical Lane Group	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	22.27	9.68	7.17	7.72
50th-Percentile Queue Length [ft/ln]	556.65	241.91	179.17	192.99
95th-Percentile Queue Length [veh/ln]	30.00	14.78	11.56	12.28
95th-Percentile Queue Length [ft/ln]	750.11	369.45	288.93	306.91

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	23.76	0.00	0.00	11.25	35.29	41.26
Movement LOS	C			B	D	D
d_A, Approach Delay [s/veh]	23.76		11.25		38.24	
Approach LOS	C		B		D	
d_I, Intersection Delay [s/veh]	23.36					
Intersection LOS	C					
Intersection V/C	0.923					

Emissions

Vehicle Miles Traveled [mph]	188.67	38.37	15.13	14.77
Stops [stops/h]	1603.15	696.71	516.02	555.81
Fuel consumption [US gal/h]	27.59	9.14	8.06	8.91
CO [g/h]	1928.46	639.15	563.09	622.77
NOx [g/h]	375.21	124.36	109.56	121.17
VOC [g/h]	446.94	148.13	130.50	144.33

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	41.41	39.61
I_p,int, Pedestrian LOS Score for Intersectio	0.000	3.238	2.443
Crosswalk LOS	F	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1308	1308	516
d_b, Bicycle Delay [s]	5.99	6.01	27.53
I_b,int, Bicycle LOS Score for Intersection	3.431	2.899	1.560
Bicycle LOS	C	C	A

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 2	-	6	-	8	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



Intersection Level Of Service Report
Intersection 2: Marsh Rd (SR 84)/US 101 SB Offramp

Control Type:	Signalized	Delay (sec / veh):	26.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.922

Intersection Setup

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	420.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		35.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

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Volumes

Name	Marsh Road		Marsh Road (SR 84)		US 101 SB Offramp	
Base Volume Input [veh/h]	0	1022	1321	279	1614	593
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	2.00	2.15	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	17	0	0	0	8
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	1039	1321	279	1614	601
Peak Hour Factor	1.0000	0.9770	0.9770	1.0000	0.9770	0.9770
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	266	338	70	413	154
Total Analysis Volume [veh/h]	0	1063	1352	279	1652	615
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		4		5	
v_ci, Inbound Pedestrian Volume crossing mi	0		5		4	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	6		1		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	52.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	6	2	0	4	5
Auxiliary Signal Groups						1,4
Maximum Green [s]	0	100	100	0	100	0
Amber [s]	0.0	4.1	4.1	0.0	3.1	0.0
All red [s]	0.0	0.5	0.5	0.0	1.0	0.0
Walk [s]	0	7	7	0	5	0
Pedestrian Clearance [s]	0	12	16	0	20	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.5	2.6	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	40	40	0	60	0
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	8	8	0	6	0
Vehicle Extension [s]	0.0	0.0	0.0	0.0	0.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	R
C, Calculated Cycle Length [s]	100	100	100	100
L, Total Lost Time per Cycle [s]	2.50	4.60	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.50	2.60	0.00	0.00
g_i, Effective Green Time [s]	46	43	50	50
g / C, Green / Cycle	0.46	0.43	0.50	0.50
(v / s)_i Volume / Saturation Flow Rate	0.27	0.38	0.48	0.39
s, saturation flow rate [veh/h]	4000	3560	3459	1589
c, Capacity [veh/h]	1823	1548	1727	794
d1, Uniform Delay [s]	20.17	25.76	24.00	20.45
k, delay calibration	0.50	0.50	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.37	7.13	1.70	0.62
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.58	0.87	0.96	0.77
d, Delay for Lane Group [s/veh]	21.54	32.89	25.70	21.07
Lane Group LOS	C	C	C	C
Critical Lane Group	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	9.20	15.25	17.85	11.20
50th-Percentile Queue Length [ft/ln]	230.00	381.28	446.20	280.02
95th-Percentile Queue Length [veh/ln]	14.17	21.66	24.78	16.69
95th-Percentile Queue Length [ft/ln]	354.36	541.39	619.41	417.24

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	0.00	21.54	32.89	0.00	25.70	21.07
Movement LOS		C	C		C	C
d_A, Approach Delay [s/veh]	21.54		32.89		24.44	
Approach LOS	C		C		C	
d_I, Intersection Delay [s/veh]	26.22					
Intersection LOS	C					
Intersection V/C	0.922					

Emissions

Vehicle Miles Traveled [mph]	132.96	114.57	325.41	121.14
Stops [stops/h]	662.41	1098.08	1285.04	403.23
Fuel consumption [US gal/h]	13.79	21.67	29.14	9.85
CO [g/h]	964.14	1515.00	2036.56	688.65
NOx [g/h]	187.59	294.76	396.24	133.99
VOC [g/h]	223.45	351.12	471.99	159.60

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	41.41	0.00	39.61
l_p,int, Pedestrian LOS Score for Intersectio	2.897	0.000	2.682
Crosswalk LOS	C	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	708	708	1118
d_b, Bicycle Delay [s]	20.93	20.88	9.72
l_b,int, Bicycle LOS Score for Intersection	2.437	2.675	1.560
Bicycle LOS	B	B	A

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 3: Marsh Rd/Rolison Rd-Scott Dr

Control Type:	Signalized	Delay (sec / veh):	31.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.842

Intersection Setup

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	1	0	0	0	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	60.00	100.00	35.00
No. of Lanes in Exit Pocket	0	0	0	0	0	1	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Marsh Road			Marsh Road			Rolison Drive			Scott Drive		
Base Volume Input [veh/h]	57	1398	2	157	1535	295	300	6	2	15	12	291
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	17	0	0	8	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	57	1415	2	157	1543	295	300	6	2	15	12	291
Peak Hour Factor	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790	0.9790
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	361	1	40	394	75	77	2	1	4	3	74
Total Analysis Volume [veh/h]	58	1445	2	160	1576	301	306	6	2	15	12	297
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	1			0			1			0		
v_di, Inbound Pedestrian Volume crossing m	1			0			1			0		
v_co, Outbound Pedestrian Volume crossing	0			0			1			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			1			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			0			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	14.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	0	1	6	0	0	4	0	0	3	0
Auxiliary Signal Groups												
Maximum Green [s]	15	40	0	10	40	0	0	20	0	0	20	0
Amber [s]	3.0	4.0	0.0	3.0	4.0	0.0	0.0	3.2	0.0	0.0	3.2	0.0
All red [s]	1.0	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	7	0	0	8	0	0	8	0
Pedestrian Clearance [s]	0	21	0	0	21	0	0	24	0	0	28	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	0.0	20.0	20.0	0.0	0.0	20.0	0.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	15	57	0	20	62	0	0	32	0	0	36	0
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	4	10	0	4	10	0	0	4	0	0	6	0
Vehicle Extension [s]	2.5	3.5	0.0	2.0	3.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	8	89	89	11	91	91	18	18	20	20
g / C, Green / Cycle	0.06	0.61	0.61	0.07	0.63	0.63	0.12	0.12	0.14	0.14
(v / s)_i Volume / Saturation Flow Rate	0.03	0.27	0.27	0.05	0.50	0.53	0.09	0.09	0.01	0.11
s, saturation flow rate [veh/h]	1781	3560	1869	3459	1870	1756	1781	1781	1819	2813
c, Capacity [veh/h]	99	2178	1143	255	1178	1106	219	219	249	384
d1, Uniform Delay [s]	66.87	14.91	14.91	65.22	19.92	21.31	61.17	61.17	54.86	60.43
k, delay calibration	0.08	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.09	0.64	1.21	0.95	5.64	8.13	3.27	3.26	0.14	2.49
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.59	0.44	0.44	0.63	0.80	0.85	0.72	0.72	0.11	0.77
d, Delay for Lane Group [s/veh]	70.97	15.55	16.12	66.16	25.56	29.44	64.44	64.44	55.00	62.92
Lane Group LOS	E	B	B	E	C	C	E	E	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.21	8.29	8.88	2.90	24.02	26.23	5.82	5.83	0.89	5.47
50th-Percentile Queue Length [ft/ln]	55.17	207.15	222.00	72.56	600.57	655.64	145.61	145.64	22.26	136.67
95th-Percentile Queue Length [veh/ln]	3.97	13.01	13.77	5.22	32.06	34.62	9.78	9.78	1.60	9.30
95th-Percentile Queue Length [ft/ln]	99.31	325.18	344.18	130.61	801.52	865.61	244.56	244.60	40.06	232.53

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	70.97	15.74	16.12	66.16	27.13	29.44	64.44	64.44	64.44	55.00	55.00	62.92
Movement LOS	E	B	B	E	C	C	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	17.87			30.53			64.44			62.26		
Approach LOS	B			C			E			E		
d_I, Intersection Delay [s/veh]	30.98											
Intersection LOS	C											
Intersection V/C	0.842											

Emissions

Vehicle Miles Traveled [mph]	11.95	195.57	102.64	20.01	117.38	117.38	4.73	4.73	1.84	20.20
Stops [stops/h]	54.79	411.45	220.47	144.12	596.43	651.12	144.60	144.64	22.10	271.45
Fuel consumption [US gal/h]	1.71	13.55	7.20	4.00	13.84	14.99	2.83	2.83	0.47	5.75
CO [g/h]	119.20	947.22	503.58	279.65	967.46	1048.03	197.52	197.57	32.82	402.06
NOx [g/h]	23.19	184.29	97.98	54.41	188.23	203.91	38.43	38.44	6.39	78.23
VOC [g/h]	27.63	219.53	116.71	64.81	224.22	242.89	45.78	45.79	7.61	93.18

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	61.00	61.00	61.92	61.92
l_p,int, Pedestrian LOS Score for Intersectio	3.062	3.280	2.148	2.403
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	717	786	383	439
d_b, Bicycle Delay [s]	29.82	26.72	47.36	44.19
l_b,int, Bicycle LOS Score for Intersection	2.387	3.240	2.078	2.094
Bicycle LOS	B	C	B	B

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



A460

Intersection Level Of Service Report
Intersection 4: Marsh Rd/Florence St-Bohannon Dr

Control Type:	Signalized	Delay (sec / veh):	47.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.888

Intersection Setup

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	155.00	100.00	100.00	90.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Marsh Road			Marsh Road			Florence Street			Bohannon Avenue		
Base Volume Input [veh/h]	271	884	93	18	1087	492	476	49	180	99	83	45
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	17	0	0	8	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	271	901	93	18	1095	492	476	49	180	99	83	45
Peak Hour Factor	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730	0.9730
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	70	232	24	5	281	126	122	13	46	25	21	12
Total Analysis Volume [veh/h]	279	926	96	18	1125	506	489	50	185	102	85	46
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			1			1			1		
v_di, Inbound Pedestrian Volume crossing m	1			1			2			1		
v_co, Outbound Pedestrian Volume crossing	0			3			3			1		
v_ci, Inbound Pedestrian Volume crossing mi	1			3			3			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			2			3			1		

A461

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	31.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	5	2	2	1	6	6	4	3	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	50	50	50	0	50	0
Amber [s]	3.0	3.6	3.6	3.0	3.6	3.6	3.2	3.0	3.2	0.0	3.2	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	7	0	7	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	12	12	0	16	16	25	25	25	0	25	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0	20.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	22	45	45	22	45	45	37	36	37	0	37	0
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	4	12	12	4	12	12	8	8	8	0	8	0
Vehicle Extension [s]	2.0	5.0	5.0	2.0	5.0	5.0	2.5	2.5	2.5	0.0	2.5	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	C	L	C	C	L	C	R	L	C
C, Calculated Cycle Length [s]	140	140	140	140	140	140	140	140	140	140	140
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	20	86	86	4	70	70	26	26	26	16	16
g / C, Green / Cycle	0.14	0.61	0.61	0.03	0.50	0.50	0.19	0.19	0.19	0.11	0.11
(v / s)_i Volume / Saturation Flow Rate	0.16	0.28	0.28	0.01	0.45	0.48	0.15	0.15	0.12	0.06	0.07
s, saturation flow rate [veh/h]	1781	1870	1801	1781	1870	1649	1781	1797	1557	1781	1748
c, Capacity [veh/h]	254	1148	1105	52	935	825	336	339	293	198	195
d1, Uniform Delay [s]	60.00	14.43	14.48	66.66	31.70	33.65	54.29	54.27	52.18	58.64	59.76
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.08	0.08	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	49.17	1.28	1.35	1.47	13.03	23.08	3.32	3.26	1.66	1.53	2.99
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.10	0.45	0.46	0.35	0.90	0.96	0.80	0.80	0.63	0.51	0.67
d, Delay for Lane Group [s/veh]	109.17	15.72	15.84	68.13	44.73	56.73	57.62	57.54	53.84	60.17	62.75
Lane Group LOS	F	B	B	E	D	E	E	E	D	E	E
Critical Lane Group	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	12.45	8.94	8.72	0.65	28.20	30.18	9.45	9.51	6.19	3.54	4.68
50th-Percentile Queue Length [ft/ln]	311.15	223.43	218.09	16.28	704.88	754.43	236.29	237.70	154.67	88.41	117.01
95th-Percentile Queue Length [veh/ln]	19.01	13.84	13.57	1.17	36.90	39.19	14.49	14.56	10.27	6.37	8.23
95th-Percentile Queue Length [ft/ln]	475.23	346.01	339.19	29.31	922.59	979.66	362.34	364.12	256.65	159.14	205.71

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	109.17	15.77	15.84	68.13	47.78	56.73	57.58	57.54	53.84	60.17	62.75	62.75
Movement LOS	F	B	B	E	D	E	E	E	D	E	E	E
d_A, Approach Delay [s/veh]	35.81			50.75			56.62			61.62		
Approach LOS	D			D			E			E		
d_I, Intersection Delay [s/veh]	47.51											
Intersection LOS	D											
Intersection V/C	0.888											

Emissions

Vehicle Miles Traveled [mph]	43.97	81.71	79.35	3.71	172.83	163.31	31.09	31.30	21.41	5.76	7.39
Stops [stops/h]	320.04	229.82	224.32	16.75	725.02	775.99	243.04	244.49	159.09	90.94	120.35
Fuel consumption [US gal/h]	10.28	6.50	6.33	0.52	19.67	21.21	5.48	5.51	3.60	1.86	2.47
CO [g/h]	718.59	454.47	442.75	36.13	1375.10	1482.44	382.99	385.25	251.64	129.77	172.43
NOx [g/h]	139.81	88.42	86.14	7.03	267.54	288.43	74.52	74.96	48.96	25.25	33.55
VOC [g/h]	166.54	105.33	102.61	8.37	318.69	343.57	88.76	89.28	58.32	30.07	39.96

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.43	59.43	59.43	59.43
l_p,int, Pedestrian LOS Score for Intersectio	2.988	3.120	2.476	2.069
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	577	577	457	469
d_b, Bicycle Delay [s]	35.45	35.46	41.72	41.06
l_b,int, Bicycle LOS Score for Intersection	2.633	2.920	2.754	1.944
Bicycle LOS	B	C	C	A

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 5: Marsh Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	50.1
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.800

Intersection Setup

Name				Marsh Road			Bay Road			Bay Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	1	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			35.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			No		

Volumes

Name				Marsh Road			Bay Road			Bay Road		
Base Volume Input [veh/h]	3	891	68	429	1033	71	101	34	6	63	90	216
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	17	0	0	8	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	3	908	68	429	1041	71	101	34	6	63	90	216
Peak Hour Factor	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420	0.9420
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	241	18	114	276	19	27	9	2	17	24	57
Total Analysis Volume [veh/h]	3	964	72	455	1105	75	107	36	6	67	96	229
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			6			0			6		
v_di, Inbound Pedestrian Volume crossing m	0			6			0			6		
v_co, Outbound Pedestrian Volume crossing	0			3			3			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			3			3			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			5			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	4.0
Offset Reference	LagCoordGreen
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	2	6	2	5	2	6	4	4	4	8	4	8
Auxiliary Signal Groups												
Maximum Green [s]	40	40	40	30	40	40	30	30	30	0	30	0
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	3.7	3.7	3.7	0.0	3.7	0.0
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	1.0	0.0
Walk [s]	0	7	0	0	0	7	7	7	7	0	7	0
Pedestrian Clearance [s]	0	17	0	0	0	17	23	23	23	0	23	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.5	0.5	0.5	1.0	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	105	70	105	35	105	70	45	45	45	0	45	0
Lead / Lag	Lag	-	-	Lag	-	-	Lag	-	-	-	-	-
Minimum Green [s]	6	7	6	7	6	7	8	8	8	0	8	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	5.0	0.0	5.0	0.0
Minimum Recall		No		No	No			No			No	
Maximum Recall		No		No	No			No			No	
Pedestrian Recall		No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	C	C	L	C	C	C	C
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	2.50	2.50	3.00	2.50	2.50	2.10	2.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	2.00	2.00
l2, Clearance Lost Time [s]	0.50	0.50	1.00	0.50	0.50	0.10	0.10
g_i, Effective Green Time [s]	68	68	32	103	103	42	42
g / C, Green / Cycle	0.46	0.46	0.21	0.69	0.69	0.28	0.28
(v / s)_i Volume / Saturation Flow Rate	0.30	0.30	0.26	0.32	0.32	0.23	0.23
s, saturation flow rate [veh/h]	1863	1653	1781	1870	1822	661	1725
c, Capacity [veh/h]	875	754	380	1290	1257	226	510
d1, Uniform Delay [s]	31.38	31.48	59.00	10.57	10.64	52.90	50.40
k, delay calibration	0.50	0.50	0.50	0.50	0.50	0.41	0.42
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.41	4.29	111.76	1.18	1.25	11.78	8.94
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.63	0.65	1.20	0.46	0.47	0.66	0.77
d, Delay for Lane Group [s/veh]	34.80	35.77	170.76	11.76	11.89	64.69	59.34
Lane Group LOS	C	D	F	B	B	E	E
Critical Lane Group	No	Yes	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	16.22	14.65	26.12	8.97	8.93	6.28	15.01
50th-Percentile Queue Length [ft/ln]	405.58	366.13	653.07	224.20	223.31	157.04	375.14
95th-Percentile Queue Length [veh/ln]	22.83	20.92	37.97	13.88	13.83	10.39	21.36
95th-Percentile Queue Length [ft/ln]	570.72	523.03	949.13	346.98	345.85	259.80	533.96

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	34.80	35.22	35.77	170.76	11.82	11.89	64.69	64.69	64.69	59.34	59.34	59.34
Movement LOS	C	D	D	F	B	B	E	E	E	E	E	E
d_A, Approach Delay [s/veh]	35.25			56.05			64.69			59.34		
Approach LOS	D			E			E			E		
d_I, Intersection Delay [s/veh]	50.13											
Intersection LOS	D											
Intersection V/C	0.800											

Emissions

Vehicle Miles Traveled [mph]	345.67	307.73	71.71	93.54	92.42	11.58	9.30
Stops [stops/h]	389.36	351.48	626.94	215.23	214.38	150.76	360.14
Fuel consumption [US gal/h]	20.27	18.17	23.26	6.60	6.55	3.06	7.11
CO [g/h]	1417.07	1270.18	1625.59	461.64	458.13	213.91	496.68
NOx [g/h]	275.71	247.13	316.28	89.82	89.14	41.62	96.64
VOC [g/h]	328.42	294.38	376.75	106.99	106.18	49.58	115.11

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	11.0	99.9	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	64.40	8.37	0.00
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.144	1.793	0.000
Crosswalk LOS	F	C	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	865	1332	537	537
d_b, Bicycle Delay [s]	24.15	8.37	40.21	40.13
l_b,int, Bicycle LOS Score for Intersection	2.417	2.908	1.805	2.206
Bicycle LOS	B	C	A	B

Sequence

Ring 1	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	68.8
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.784

Intersection Setup

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	235	224	37	40	190	24	101	584	160	78	455	62
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	7	0	0	16	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	235	224	37	40	190	24	101	591	160	78	471	62
Peak Hour Factor	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	63	60	10	11	51	6	27	158	43	21	126	17
Total Analysis Volume [veh/h]	252	240	40	43	203	26	108	633	171	84	504	66
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	20			17			18			20		
v_di, Inbound Pedestrian Volume crossing m	20			18			17			20		
v_co, Outbound Pedestrian Volume crossing	34			29			33			29		
v_ci, Inbound Pedestrian Volume crossing mi	33			29			34			29		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	20			7			1			5		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	180
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	35	35	35	35	35	35	30	60	60	30	30	30
Amber [s]	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	46	40	46	40	46	13	84	84	10	81	81
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	4	4	4	4	4
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	180	180	180	180	180	180	180	180
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	0.00	2.10	0.00	2.00
g_i, Effective Green Time [s]	42	42	36	36	90	80	90	77
g / C, Green / Cycle	0.23	0.23	0.20	0.20	0.50	0.44	0.50	0.43
(v / s)_i Volume / Saturation Flow Rate	0.14	0.16	0.02	0.13	0.11	0.46	0.11	0.32
s, saturation flow rate [veh/h]	1781	1779	1781	1815	953	1758	775	1809
c, Capacity [veh/h]	415	414	355	362	320	780	160	777
d1, Uniform Delay [s]	61.71	62.87	59.11	66.01	31.12	50.05	41.96	42.74
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.50	0.19	0.28
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.49	8.57	0.70	8.16	0.62	40.23	4.72	3.50
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.68	0.12	0.63	0.34	1.03	0.53	0.73
d, Delay for Lane Group [s/veh]	68.20	71.44	59.80	74.16	31.74	90.28	46.68	46.23
Lane Group LOS	E	E	E	E	C	F	D	D
Critical Lane Group	No	Yes	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	11.16	12.77	1.72	10.61	2.62	43.69	2.18	22.07
50th-Percentile Queue Length [ft/ln]	279.03	319.36	42.88	265.34	65.50	1092.25	54.41	551.81
95th-Percentile Queue Length [veh/ln]	16.64	18.64	3.09	15.96	4.72	55.86	3.92	29.78
95th-Percentile Queue Length [ft/ln]	416.01	465.90	77.19	398.91	117.90	1396.46	97.95	744.43

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	68.20	71.44	71.44	59.80	74.16	74.16	31.74	90.28	90.28	46.68	46.23	46.23
Movement LOS	E	E	E	E	E	E	C	F	F	D	D	D
d_A, Approach Delay [s/veh]	69.91			71.89			83.35			46.29		
Approach LOS	E			E			F			D		
d_I, Intersection Delay [s/veh]	68.79											
Intersection LOS	E											
Intersection V/C	0.784											

Emissions

Vehicle Miles Traveled [mph]	5.97	6.63	1.02	5.43	25.63	190.83	32.20	218.52
Stops [stops/h]	223.23	255.49	34.31	212.27	52.40	873.80	43.53	441.44
Fuel consumption [US gal/h]	4.98	5.75	0.70	4.51	2.04	27.45	2.36	16.80
CO [g/h]	347.81	402.24	48.98	315.54	142.75	1918.88	165.24	1174.09
NOx [g/h]	67.67	78.26	9.53	61.39	27.77	373.34	32.15	228.43
VOC [g/h]	80.61	93.22	11.35	73.13	33.08	444.72	38.30	272.11

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	79.34	79.34	79.34	79.34
l_p,int, Pedestrian LOS Score for Intersectio	2.349	2.226	2.577	2.418
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	460	393	881	848
d_b, Bicycle Delay [s]	53.90	58.28	28.18	29.95
l_b,int, Bicycle LOS Score for Intersection	2.437	2.008	3.064	2.639
Bicycle LOS	B	B	C	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 7: El Camino Real (SR 82)/Ravenswood Ave-Menlo Ave

Control Type:	Signalized	Delay (sec / veh):	47.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.819

Intersection Setup

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	1	0	0	0	1	0	1
Entry Pocket Length [ft]	320.00	100.00	100.00	240.00	100.00	65.00	100.00	100.00	100.00	240.00	100.00	135.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	35.00			35.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	No			Yes			Yes			Yes		

Volumes

Name	El Camino Real (SR 82)			El Camino Real (SR 82)			Menlo Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	227	1389	606	198	1228	161	106	348	96	391	228	124
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	5	2	0	0	0	0	0	11	0	5
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	227	1389	611	200	1228	161	106	348	96	402	228	129
Peak Hour Factor	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	58	353	155	51	312	41	27	89	24	102	58	33
Total Analysis Volume [veh/h]	231	1413	622	203	1249	164	108	354	98	409	232	131
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			19			0			18		
v_di, Inbound Pedestrian Volume crossing m	0			18			0			19		
v_co, Outbound Pedestrian Volume crossing	6			15			16			6		
v_ci, Inbound Pedestrian Volume crossing mi	6			16			15			6		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	5			0			13			14		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	1 - ECR
Cycle Length [s]	150
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	65.6
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Split	Split	Split	Split	Split	Split
Signal Group	1	6	6	5	2	2	8	3	8	4	4	4
Auxiliary Signal Groups												
Maximum Green [s]	50	50	50	50	50	50	0	50	0	50	50	50
Amber [s]	4.1	4.1	4.1	4.1	4.1	4.1	0.0	3.0	0.0	3.0	3.0	3.0
All red [s]	1.0	4.0	4.0	1.0	4.0	4.0	0.0	1.0	0.0	4.0	4.0	4.0
Walk [s]	0	10	10	0	10	10	0	0	0	5	5	5
Pedestrian Clearance [s]	0	23	23	0	15	15	0	0	0	23	23	23
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	1.2	2.1	2.1	1.0	2.1	2.1	0.0	1.0	0.0	1.0	1.0	1.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	20	64	64	27	71	71	0	27	0	32	32	32
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	Lag	-	-
Minimum Green [s]	8	10	10	8	10	10	0	7	0	4	4	4
Vehicle Extension [s]	2.0	4.0	4.0	2.0	4.0	4.0	0.0	2.0	0.0	2.0	2.0	2.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	Yes			No			No	
Pedestrian Recall	No	No		No	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	R	C	C	L	C	R
C, Calculated Cycle Length [s]	150	150	150	150	150	150	150	150	150	150	150
L, Total Lost Time per Cycle [s]	3.20	4.10	4.10	3.00	4.10	4.10	3.00	3.00	3.00	3.00	3.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	1.20	2.10	2.10	1.00	2.10	2.10	1.00	1.00	1.00	1.00	1.00
g_i, Effective Green Time [s]	17	63	63	21	67	67	25	25	28	28	28
g / C, Green / Cycle	0.11	0.42	0.42	0.14	0.45	0.45	0.16	0.16	0.19	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.13	0.40	0.40	0.11	0.35	0.11	0.16	0.16	0.12	0.12	0.09
s, saturation flow rate [veh/h]	1781	3560	1553	1781	3560	1534	1835	1738	3459	1870	1455
c, Capacity [veh/h]	199	1507	657	244	1592	686	300	284	654	353	275
d1, Uniform Delay [s]	63.80	30.83	30.48	56.22	14.68	11.18	62.17	62.39	55.94	56.31	53.76
k, delay calibration	0.04	0.50	0.50	0.04	0.50	0.50	0.04	0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	76.10	12.41	24.09	2.82	3.96	0.82	7.09	9.57	0.37	0.78	0.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.33	1.33	1.33	1.67	1.67	1.67	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	1.16	0.94	0.95	0.83	0.78	0.24	0.95	0.97	0.63	0.66	0.48
d, Delay for Lane Group [s/veh]	139.90	43.24	54.57	59.04	18.64	12.00	69.26	71.96	56.31	57.09	54.23
Lane Group LOS	F	D	D	E	B	B	E	E	E	E	D
Critical Lane Group	No	No	Yes	Yes	No	No	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	11.56	23.61	22.61	6.95	9.09	1.74	11.37	11.20	7.20	8.26	4.45
50th-Percentile Queue Length [ft/ln]	288.88	590.27	565.31	173.86	227.27	43.58	284.18	280.00	180.06	206.58	111.24
95th-Percentile Queue Length [veh/ln]	18.16	31.58	30.41	11.28	14.04	3.14	16.90	16.69	11.60	12.98	7.91
95th-Percentile Queue Length [ft/ln]	453.94	789.49	760.28	281.99	350.89	78.44	422.42	417.21	290.10	324.44	197.72

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	139.90	43.24	54.57	59.04	18.64	12.00	69.26	70.61	71.96	56.31	57.09	54.23
Movement LOS	F	D	D	E	B	B	E	E	E	E	E	D
d_A, Approach Delay [s/veh]	56.20			23.04			70.58			56.19		
Approach LOS	E			C			E			E		
d_I, Intersection Delay [s/veh]	47.47											
Intersection LOS	D											
Intersection V/C	0.819											

Emissions

Vehicle Miles Traveled [mph]	5.48	33.50	14.75	4.81	29.61	3.89	6.74	6.51	97.08	55.07	31.09
Stops [stops/h]	277.32	1133.32	542.70	166.91	436.36	41.83	272.81	268.80	345.72	198.32	106.79
Fuel consumption [US gal/h]	8.87	22.23	11.55	3.88	9.15	0.86	5.80	5.78	10.59	6.06	3.32
CO [g/h]	620.00	1554.07	807.31	271.01	639.44	60.34	405.36	404.11	740.41	423.41	231.76
NOx [g/h]	120.63	302.37	157.07	52.73	124.41	11.74	78.87	78.62	144.06	82.38	45.09
VOC [g/h]	143.69	360.17	187.10	62.81	148.20	13.98	93.95	93.66	171.60	98.13	53.71

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	14.0	14.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	66.27	61.65	61.65
l_p,int, Pedestrian LOS Score for Intersectio	0.000	3.098	2.349	2.792
Crosswalk LOS	F	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	745	839	307	333
d_b, Bicycle Delay [s]	29.59	25.29	54.12	52.45
l_b,int, Bicycle LOS Score for Intersection	3.429	2.893	2.022	2.833
Bicycle LOS	C	C	B	C

Sequence

Ring 1	1	2	4	3	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 8: Middlefield Rd/Ravenswood Ave

Control Type:	Signalized	Delay (sec / veh):	32.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.715

Intersection Setup

Name	Middlefield Road				Ravenswood Avenue	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	120.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		Yes	

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Volumes

Name	Middlefield Road				Ravenswood Avenue	
Base Volume Input [veh/h]	311	704	407	103	251	522
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	16	28	13	0	0	7
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	327	732	420	103	251	529
Peak Hour Factor	0.9708	0.9708	0.9708	0.9708	0.9708	0.9708
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	84	189	108	27	65	136
Total Analysis Volume [veh/h]	337	754	433	106	259	545
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	12		0		11	
v_di, Inbound Pedestrian Volume crossing m	11		0		12	
v_co, Outbound Pedestrian Volume crossing	0		5		6	
v_ci, Inbound Pedestrian Volume crossing mi	0		6		5	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	27		9		11	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protected	Permissive	Permissive	Permissive	Permissive	Overlap
Signal Group	5	2	6	4	7	5
Auxiliary Signal Groups						5,7
Maximum Green [s]	34	35	70	0	35	34
Amber [s]	3.5	3.5	3.5	0.0	3.5	3.5
All red [s]	1.0	1.0	1.0	0.0	1.0	1.0
Walk [s]	0	7	7	0	7	0
Pedestrian Clearance [s]	0	18	18	0	15	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	6.1	0.0	0.0	0.0	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	0.0	20.0	0.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	38	91	53	0	39	38
Lead / Lag	Lag	-	-	-	Lag	-
Minimum Green [s]	7	7	7	0	7	7
Vehicle Extension [s]	3.0	3.0	2.5	0.0	2.0	3.0
Minimum Recall	No	No	No		No	No
Maximum Recall	No	Yes	Yes		No	No
Pedestrian Recall	No	No	No		Yes	No

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	L	R
C, Calculated Cycle Length [s]	130	130	130	130	130
L, Total Lost Time per Cycle [s]	4.50	8.10	2.00	2.00	2.00
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.50	6.10	0.00	0.00	0.00
g_i, Effective Green Time [s]	27	85	59	35	67
g / C, Green / Cycle	0.21	0.65	0.45	0.27	0.52
(v / s)_i Volume / Saturation Flow Rate	0.19	0.40	0.30	0.15	0.35
s, saturation flow rate [veh/h]	1781	1870	1791	1781	1575
c, Capacity [veh/h]	377	1219	810	482	784
d1, Uniform Delay [s]	49.84	13.21	27.87	40.47	24.98
k, delay calibration	0.25	0.50	0.50	0.08	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	15.40	2.36	4.29	0.73	5.05
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.89	0.62	0.67	0.54	0.70
d, Delay for Lane Group [s/veh]	65.24	15.57	32.16	41.20	30.03
Lane Group LOS	E	B	C	D	C
Critical Lane Group	No	No	Yes	Yes	Yes
50th-Percentile Queue Length [veh/ln]	12.15	12.74	13.97	7.21	13.77
50th-Percentile Queue Length [ft/ln]	303.85	318.47	349.31	180.29	344.30
95th-Percentile Queue Length [veh/ln]	17.87	18.59	20.10	11.62	19.86
95th-Percentile Queue Length [ft/ln]	446.79	464.80	502.56	290.39	496.45

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	65.24	15.57	32.16	32.16	41.20	30.03
Movement LOS	E	B	C	C	D	C
d_A, Approach Delay [s/veh]	30.92		32.16		33.63	
Approach LOS	C		C		C	
d_I, Intersection Delay [s/veh]	32.09					
Intersection LOS	C					
Intersection V/C	0.715					

Emissions

Vehicle Miles Traveled [mph]	31.84	71.25	571.45	99.29	208.94
Stops [stops/h]	336.58	352.77	386.92	199.70	381.38
Fuel consumption [US gal/h]	8.22	7.76	29.19	7.36	14.04
CO [g/h]	574.50	542.32	2040.36	514.61	981.26
NOx [g/h]	111.78	105.52	396.98	100.12	190.92
VOC [g/h]	133.15	125.69	472.87	119.27	227.42

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	0.00	54.47
l_p,int, Pedestrian LOS Score for Intersectio	2.737	0.000	2.363
Crosswalk LOS	B	F	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1331	746	531
d_b, Bicycle Delay [s]	7.38	25.66	35.27
l_b,int, Bicycle LOS Score for Intersection	3.360	2.449	1.560
Bicycle LOS	C	B	A

Sequence

Ring 1	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 9: Middlefield Rd/Ringwood Ave

Control Type:	Signalized	Delay (sec / veh):	39.4
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.722

Intersection Setup

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	30.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	2	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	49.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	35.00			35.00			20.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			D Street			Ringwood Avenue		
Base Volume Input [veh/h]	21	772	126	367	581	4	95	89	18	257	7	349
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	44	0	0	20	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	21	816	126	367	601	4	95	89	18	257	7	349
Peak Hour Factor	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857	0.9857
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	207	32	93	152	1	24	23	5	65	2	89
Total Analysis Volume [veh/h]	21	828	128	372	610	4	96	90	18	261	7	354
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	6			1			6			0		
v_di, Inbound Pedestrian Volume crossing m	6			0			6			1		
v_co, Outbound Pedestrian Volume crossing	1			7			8			2		
v_ci, Inbound Pedestrian Volume crossing mi	2			8			7			1		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	18			14			5			21		

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Version 2024 (SP 0-6) 2/10/2026

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	130
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	77.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	8	1	6	4	2	8	2	6	8	6
Auxiliary Signal Groups												
Maximum Green [s]	10	35	35	10	50	0	35	35	35	50	35	50
Amber [s]	3.5	3.5	3.5	3.5	3.5	0.0	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	7	0	7	0	7	7	7	7	7	7
Pedestrian Clearance [s]	0	18	26	0	18	0	18	26	18	18	26	18
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
l1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0
l2, Clearance Lost Time [s]	0.0	0.0	0.0	0.5	6.1	0.0	0.0	0.0	0.0	6.1	0.0	6.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	10	53	38	39	82	0	53	38	53	82	38	82
Lead / Lag	Lead	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	5	10	7	4	7	0	10	7	10	7	7	7
Vehicle Extension [s]	2.0	3.0	3.0	3.0	2.5	0.0	3.0	3.0	3.0	2.5	3.0	2.5
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	Yes		No	No			No			No	
Pedestrian Recall	No	No		Yes	No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	R
C, Calculated Cycle Length [s]	130	130	130	130	130	130	130	130	130	130
L, Total Lost Time per Cycle [s]	2.00	2.00	2.00	2.50	8.10	8.10	2.00	2.00	2.00	2.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	0.00	0.00	0.00	0.50	6.10	6.10	0.00	0.00	0.00	0.00
g_i, Effective Green Time [s]	5	51	51	31	71	71	42	42	42	42
g / C, Green / Cycle	0.04	0.39	0.39	0.24	0.55	0.55	0.32	0.32	0.32	0.32
(v / s)_i Volume / Saturation Flow Rate	0.01	0.23	0.08	0.21	0.16	0.16	0.09	0.06	0.26	0.23
s, saturation flow rate [veh/h]	1781	3560	1525	1781	1870	1864	1020	1807	1036	1546
c, Capacity [veh/h]	71	1402	601	421	1024	1021	95	578	386	494
d1, Uniform Delay [s]	60.64	31.12	25.98	47.90	15.94	15.94	63.95	31.99	45.25	38.70
k, delay calibration	0.04	0.50	0.50	0.32	0.50	0.50	0.11	0.11	0.39	0.31
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.85	1.83	0.81	16.06	0.75	0.76	45.93	0.15	7.77	5.48
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.30	0.59	0.21	0.88	0.30	0.30	1.01	0.19	0.69	0.72
d, Delay for Lane Group [s/veh]	61.49	32.96	26.79	63.96	16.69	16.69	109.88	32.15	53.02	44.18
Lane Group LOS	E	C	C	E	B	B	F	C	D	D
Critical Lane Group	No	Yes	No	Yes	No	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.69	10.50	2.75	13.38	5.09	5.08	4.41	2.56	8.92	10.61
50th-Percentile Queue Length [ft/ln]	17.19	262.54	68.83	334.54	127.26	127.01	110.15	64.10	223.09	265.36
95th-Percentile Queue Length [veh/ln]	1.24	15.82	4.96	19.38	8.79	8.78	7.90	4.62	13.82	15.96
95th-Percentile Queue Length [ft/ln]	30.94	395.41	123.89	484.52	219.77	219.42	197.40	115.38	345.57	398.94

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	61.49	32.96	26.79	63.96	16.69	16.69	109.88	32.15	32.15	53.02	53.02	44.18
Movement LOS	E	C	C	E	B	B	F	C	C	D	D	D
d_A, Approach Delay [s/veh]	32.76			34.53			68.73			47.99		
Approach LOS	C			C			E			D		
d_I, Intersection Delay [s/veh]	39.41											
Intersection LOS	D											
Intersection V/C	0.722											

Emissions

Vehicle Miles Traveled [mph]	6.66	262.73	40.62	35.15	29.04	28.98	6.48	7.29	6.34	8.37
Stops [stops/h]	19.04	581.63	76.24	370.57	140.97	140.68	122.01	71.00	247.11	293.94
Fuel consumption [US gal/h]	0.66	19.94	2.82	8.97	3.21	3.20	2.77	1.24	4.52	5.15
CO [g/h]	46.13	1393.92	197.06	626.87	224.45	223.98	193.39	86.80	315.79	360.06
NOx [g/h]	8.98	271.21	38.34	121.97	43.67	43.58	37.63	16.89	61.44	70.05
VOC [g/h]	10.69	323.05	45.67	145.28	52.02	51.91	44.82	20.12	73.19	83.45

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	54.47	54.47	54.47	54.47
I_p,int, Pedestrian LOS Score for Intersectio	3.380	2.969	2.009	2.352
Crosswalk LOS	C	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	746	1192	515	515
d_b, Bicycle Delay [s]	25.78	10.68	35.91	36.20
I_b,int, Bicycle LOS Score for Intersection	2.366	2.373	1.896	2.586
Bicycle LOS	B	B	A	B

Sequence

Ring 1	1	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	63.5
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.828

Intersection Setup

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Base Volume Input [veh/h]	105	415	330	234	451	27	31	374	277	465	151	374
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	2	0	60	5	0	0	0	0	0	0	26
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	105	417	330	294	456	27	31	374	277	465	151	400
Peak Hour Factor	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	109	86	77	119	7	8	98	72	121	39	104
Total Analysis Volume [veh/h]	110	435	344	307	476	28	32	390	289	485	158	417
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			6			0			6		
v_di, Inbound Pedestrian Volume crossing m	0			6			0			6		
v_co, Outbound Pedestrian Volume crossing	4			5			5			5		
v_ci, Inbound Pedestrian Volume crossing mi	5			5			5			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			14			50			19		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Split	Permiss	Split	Split	Split	Permiss	Permiss	Split	Split
Signal Group	0	3	0	2	2	2	8	1	0	0	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	45	0	30	30	30	0	40	0	0	45	45
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	0.0	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	0	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	0.0	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	38	0	29	29	29	0	40	0	0	34	34
Lead / Lag	-	-	-	Lag	-	-	-	-	-	-	-	-
Minimum Green [s]	0	5	0	5	5	5	0	5	0	0	5	5
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	141	141	141	141	141	141	141	141	141	141	141	141	141
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	25	25	25	25	24	24	24	32	32	32	42	42	42
g / C, Green / Cycle	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.23	0.23	0.23	0.30	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.06	0.15	0.15	0.15	0.15	0.15	0.15	0.02	0.21	0.19	0.18	0.18	0.27
s, saturation flow rate [veh/h]	1781	1870	1725	1549	1781	1855	1818	1781	1870	1492	1781	1824	1548
c, Capacity [veh/h]	315	331	305	274	305	317	311	402	422	337	527	539	458
d1, Uniform Delay [s]	50.90	56.15	56.27	56.17	56.88	56.86	56.97	43.03	53.39	51.65	42.68	42.46	47.41
k, delay calibration	0.11	0.11	0.11	0.11	0.22	0.22	0.22	0.11	0.26	0.22	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.66	5.92	6.83	8.22	13.61	13.04	14.31	0.08	17.76	12.05	5.21	4.80	24.89
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.35	0.85	0.86	0.87	0.87	0.87	0.87	0.08	0.92	0.86	0.61	0.60	0.91
d, Delay for Lane Group [s/veh]	51.56	62.07	63.10	64.38	70.49	69.91	71.27	43.11	71.15	63.69	47.89	47.26	72.30
Lane Group LOS	D	E	E	E	E	E	E	D	E	E	D	D	E
Critical Lane Group	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.50	10.21	9.62	8.85	10.32	10.69	10.70	0.90	15.61	10.82	10.53	10.44	17.25
50th-Percentile Queue Length [ft/ln]	87.52	255.1	240.4	221.2	258.06	267.29	267.52	22.59	390.16	270.54	263.36	261.06	431.14
95th-Percentile Queue Length [veh/ln]	6.30	15.44	14.70	13.73	15.59	16.05	16.07	1.63	22.09	16.22	15.86	15.74	24.06
95th-Percentile Queue Length [ft/ln]	157.5	386.1	367.6	343.1	389.78	401.36	401.64	40.66	552.13	405.41	396.43	393.55	601.41

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	51.56	62.44	64.04	70.41	70.61	71.27	43.11	71.15	63.69	47.68	47.26	72.30
Movement LOS	D	E	E	E	E	E	D	E	E	D	D	E
d_A, Approach Delay [s/veh]	61.69			70.55			66.86			57.30		
Approach LOS	E			E			E			E		
d_I, Intersection Delay [s/veh]	63.48											
Intersection LOS	E											
Intersection V/C	0.828											

Emissions

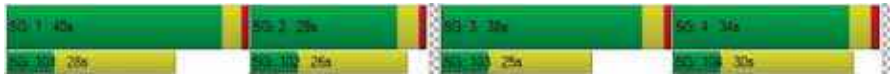
Vehicle Miles Traveled [mph]	3.15	8.02	7.49	6.82	85.47	88.95	88.07	0.76	9.24	6.85	136.68	136.68	177.29
Stops [stops/h]	89.39	260.5	245.5	225.9	263.55	272.98	273.21	23.07	398.46	276.29	268.96	266.61	440.32
Fuel consumption [US gal/h]	1.78	5.30	5.02	4.65	8.76	9.08	9.08	0.44	8.23	5.55	10.31	10.26	15.80
CO [g/h]	124.2	370.6	350.8	324.8	612.44	634.61	634.75	30.71	575.11	388.21	720.73	717.27	1104.17
NOx [g/h]	24.18	72.12	68.25	63.21	119.16	123.47	123.50	5.98	111.90	75.53	140.23	139.55	214.83
VOC [g/h]	28.80	85.91	81.30	75.29	141.94	147.08	147.11	7.12	133.29	89.97	167.04	166.23	255.90

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	59.01	59.01	59.01	59.01
l_p,int, Pedestrian LOS Score for Intersectio	2.821	2.651	2.397	2.662
Crosswalk LOS	C	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	472	345	506	416
d_b, Bicycle Delay [s]	41.13	48.63	40.33	44.67
l_b,int, Bicycle LOS Score for Intersection	2.293	2.229	2.733	3.309
Bicycle LOS	B	B	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 11: Willow Rd/Gilbert Ave

Control Type:	Signalized	Delay (sec / veh):	35.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.873

Intersection Setup

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	90.00	100.00	100.00	55.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Gilbert Avenue			Gilbert Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	130	45	129	76	108	7	3	949	129	58	954	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	60	0	0	26	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	130	45	129	76	108	7	3	1009	129	58	980	8
Peak Hour Factor	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297	0.9297
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	35	12	35	20	29	2	1	271	35	16	264	2
Total Analysis Volume [veh/h]	140	48	139	82	116	8	3	1085	139	62	1054	9
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	4			2			3			1		
v_di, Inbound Pedestrian Volume crossing m	3			1			4			2		
v_co, Outbound Pedestrian Volume crossing	2			1			1			2		
v_ci, Inbound Pedestrian Volume crossing mi	2			1			1			2		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	7			5			15			12		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	69
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	14	14	14	14	14	14
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	47	0	47	47	47	23	23	23	23	23	23
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	5	0	5	5	5	12	12	12	12	12	12
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	70	70	70	70	70	70	70	70
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	2.00	0.00	2.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	17	17	17	17	45	45	45	45
g / C, Green / Cycle	0.24	0.24	0.24	0.24	0.64	0.64	0.64	0.64
(v / s)_i Volume / Saturation Flow Rate	0.11	0.12	0.07	0.07	0.01	0.67	0.14	0.57
s, saturation flow rate [veh/h]	1263	1623	1193	1844	531	1825	456	1867
c, Capacity [veh/h]	308	395	244	448	171	1167	103	1194
d1, Uniform Delay [s]	27.64	22.66	29.22	21.49	26.76	12.61	35.00	10.55
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.05	0.88	0.80	0.33	0.19	40.01	23.44	10.14
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.46	0.47	0.34	0.28	0.02	1.05	0.60	0.89
d, Delay for Lane Group [s/veh]	28.69	23.54	30.02	21.83	26.94	52.62	58.44	20.69
Lane Group LOS	C	C	C	C	C	F	E	C
Critical Lane Group	No	Yes	No	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.24	2.65	1.33	1.65	0.05	27.01	1.71	14.06
50th-Percentile Queue Length [ft/ln]	55.98	66.21	33.28	41.16	1.30	675.28	42.77	351.50
95th-Percentile Queue Length [veh/ln]	4.03	4.77	2.40	2.96	0.09	36.99	3.08	20.21
95th-Percentile Queue Length [ft/ln]	100.76	119.19	59.91	74.08	2.34	924.78	76.99	505.24

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	28.69	23.54	23.54	30.02	21.83	21.83	26.94	52.62	52.62	58.44	20.69	20.69
Movement LOS	C	C	C	C	C	C	C	D	D	E	C	C
d_A, Approach Delay [s/veh]	25.75			25.09			52.55			22.77		
Approach LOS	C			C			D			C		
d_I, Intersection Delay [s/veh]	35.94											
Intersection LOS	D											
Intersection V/C	0.873											

Emissions

Vehicle Miles Traveled [mph]	9.84	13.15	7.10	10.74	1.28	520.38	6.21	106.52
Stops [stops/h]	115.15	136.21	68.47	84.67	2.68	1389.15	87.99	723.09
Fuel consumption [US gal/h]	1.70	2.01	1.08	1.36	0.08	41.84	1.35	12.04
CO [g/h]	118.96	140.48	75.70	94.95	5.88	2924.29	94.66	841.62
NOx [g/h]	23.14	27.33	14.73	18.47	1.14	568.96	18.42	163.75
VOC [g/h]	27.57	32.56	17.54	22.01	1.36	677.73	21.94	195.05

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.86	24.86	24.86	24.86
l_p,int, Pedestrian LOS Score for Intersectio	2.189	2.003	2.783	2.728
Crosswalk LOS	B	B	C	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1226	1226	540	540
d_b, Bicycle Delay [s]	5.26	5.26	18.79	18.76
l_b,int, Bicycle LOS Score for Intersection	2.099	1.900	3.584	3.416
Bicycle LOS	B	A	D	C

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 12: Willow Rd/Coleman Ave

Control Type:	Signalized	Delay (sec / veh):	32.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.942

Intersection Setup

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	25.00			30.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

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Volumes

Name	Coleman Avenue			Coleman Avenue			Willow Road			Willow Road		
Base Volume Input [veh/h]	9	8	8	211	7	52	32	1092	5	9	1011	137
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	60	0	0	26	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	8	8	211	7	52	32	1152	5	9	1037	137
Peak Hour Factor	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405	0.9405
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	2	2	56	2	14	9	306	1	2	276	36
Total Analysis Volume [veh/h]	10	9	9	224	7	55	34	1225	5	10	1103	146
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	11			8			10			8		
v_di, Inbound Pedestrian Volume crossing m	10			8			11			8		
v_co, Outbound Pedestrian Volume crossing	15			19			19			15		
v_ci, Inbound Pedestrian Volume crossing mi	15			19			19			15		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	4			4			8			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	80.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	8	4	8	4	4	4	2	2	2	6	6	6
Auxiliary Signal Groups												
Maximum Green [s]	0	24	0	24	24	24	60	60	60	60	60	60
Amber [s]	0.0	3.1	0.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	0	7	0	7	7	7	7	7	7	7	7	7
Pedestrian Clearance [s]	0	15	0	15	15	15	11	11	11	13	13	13
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.1	0.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	30	0	30	30	30	90	90	90	90	90	90
Lead / Lag	-	-	-	Lag	-	-	Lag	-	-	Lag	-	-
Minimum Green [s]	0	4	0	4	4	4	10	10	10	10	10	10
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			Yes			Yes	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	C	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10
l1_p, Permitted Start-Up Lost Time [s]	2.00	2.00	2.00	0.00	2.00	0.00
I2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	2.10	2.10
g_i, Effective Green Time [s]	26	26	86	86	86	86
g / C, Green / Cycle	0.21	0.21	0.72	0.72	0.72	0.72
(v / s)_i Volume / Saturation Flow Rate	0.02	0.20	0.08	0.66	0.02	0.68
s, saturation flow rate [veh/h]	1701	1418	445	1868	453	1824
c, Capacity [veh/h]	405	357	106	1340	132	1308
d1, Uniform Delay [s]	37.65	45.96	52.26	14.03	43.37	15.21
k, delay calibration	0.11	0.39	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	13.80	7.84	11.45	1.11	16.17
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.07	0.80	0.32	0.92	0.08	0.95
d, Delay for Lane Group [s/veh]	37.72	59.76	60.10	25.48	44.48	31.37
Lane Group LOS	D	E	E	C	D	C
Critical Lane Group	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.68	9.70	1.23	28.63	0.30	31.80
50th-Percentile Queue Length [ft/ln]	16.94	242.51	30.84	715.75	7.45	795.06
95th-Percentile Queue Length [veh/ln]	1.22	14.81	2.22	37.41	0.54	41.05
95th-Percentile Queue Length [ft/ln]	30.49	370.20	55.51	935.13	13.41	1026.27

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	37.72	37.72	37.72	59.76	59.76	59.76	60.10	25.48	25.48	44.48	31.37	31.37
Movement LOS	D	D	D	E	E	E	E	C	C	D	C	C
d_A, Approach Delay [s/veh]	37.72			59.76			26.41			31.48		
Approach LOS	D			E			C			C		
d_I, Intersection Delay [s/veh]	32.13											
Intersection LOS	C											
Intersection V/C	0.942											

Emissions

Vehicle Miles Traveled [mph]	0.80		6.78		3.41	123.26	2.95	368.55
Stops [stops/h]	20.33		291.01		37.01	858.90	8.94	954.07
Fuel consumption [US gal/h]	0.33		5.37		0.71	15.22	0.26	28.42
CO [g/h]	22.99		375.02		49.70	1063.54	18.27	1986.36
NOx [g/h]	4.47		72.96		9.67	206.93	3.55	386.47
VOC [g/h]	5.33		86.91		11.52	246.48	4.23	460.36

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
l_p,int, Pedestrian LOS Score for Intersectio	1.763	2.009	2.627	3.126
Crosswalk LOS	A	B	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	432	432	1432	1432
d_b, Bicycle Delay [s]	36.97	36.97	4.86	4.85
l_b,int, Bicycle LOS Score for Intersection	1.606	2.032	3.645	3.637
Bicycle LOS	A	B	D	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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Intersection Level Of Service Report
Intersection 13: Willow Rd/Durham St-VA Med Entrance

Control Type:	Signalized	Delay (sec / veh):	24.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.779

Intersection Setup

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	50.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Speed [mph]	25.00			10.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Durham Street			VA Medical Center			Willow Road			Willow Road		
Base Volume Input [veh/h]	39	40	85	54	34	14	11	1265	12	46	1087	29
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	60	0	0	26	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	39	40	85	54	34	14	11	1325	12	46	1113	29
Peak Hour Factor	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	10	22	14	9	4	3	337	3	12	283	7
Total Analysis Volume [veh/h]	40	41	87	55	35	14	11	1349	12	47	1133	30
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	10			2			9			1		
v_di, Inbound Pedestrian Volume crossing m	9			1			10			2		
v_co, Outbound Pedestrian Volume crossing	5			4			5			5		
v_ci, Inbound Pedestrian Volume crossing mi	5			5			4			5		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			3			9		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	40
Active Pattern	Free Running (No Pattern)
Coordination Type	*Free Running*
Actuation Type	*Fully actuated*
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	7.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	8	8	8	4	4	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	30	30	30	30	30	30	30	100	100	30	100	100
Amber [s]	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	15	15	15	15	15	15	0	11	11	0	15	15
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Free Running (No Pattern)

Split [s]	30	30	30	30	30	30	0	30	30	0	30	30
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	30	30	4	30	30
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Minimum Recall		No			No		Yes	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	R	L	C	C	L	C
C, Calculated Cycle Length [s]	127	127	127	127	127	127	127	127	127	127
L, Total Lost Time per Cycle [s]	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
g_i, Effective Green Time [s]	14	14	8	8	8	1	83	83	4	86
g / C, Green / Cycle	0.11	0.11	0.06	0.06	0.06	0.01	0.65	0.65	0.03	0.68
(v / s)_i Volume / Saturation Flow Rate	0.02	0.08	0.03	0.02	0.01	0.01	0.36	0.36	0.03	0.63
s, saturation flow rate [veh/h]	1781	1620	1781	1849	1433	1781	1870	1863	1781	1860
c, Capacity [veh/h]	193	175	108	112	87	18	1224	1219	62	1263
d1, Uniform Delay [s]	51.53	54.70	57.33	57.29	56.38	62.44	11.89	11.90	60.62	17.42
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.23	0.23	0.11	0.38
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.53	5.75	2.52	2.34	0.86	28.54	0.85	0.86	17.33	9.83
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.21	0.73	0.41	0.40	0.16	0.61	0.56	0.56	0.76	0.92
d, Delay for Lane Group [s/veh]	52.06	60.45	59.85	59.63	57.24	90.98	12.74	12.76	77.95	27.25
Lane Group LOS	D	E	E	E	E	F	B	B	E	C
Critical Lane Group	No	Yes	Yes	No	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.20	4.27	1.50	1.51	0.46	0.50	10.22	10.20	1.81	30.22
50th-Percentile Queue Length [ft/ln]	30.06	106.69	37.44	37.87	11.48	12.42	255.40	254.97	45.17	755.59
95th-Percentile Queue Length [veh/ln]	2.16	7.66	2.70	2.73	0.83	0.89	15.46	15.44	3.25	39.24
95th-Percentile Queue Length [ft/ln]	54.11	191.39	67.39	68.17	20.66	22.36	386.45	385.90	81.31	980.99

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	52.06	60.45	60.45	59.81	59.63	57.24	90.98	12.75	12.76	77.95	27.25	27.25
Movement LOS	D	E	E	E	E	E	F	B	B	E	C	C
d_A, Approach Delay [s/veh]	58.45			59.40			13.38			29.21		
Approach LOS	E			E			B			C		
d_I, Intersection Delay [s/veh]	24.42											
Intersection LOS	C											
Intersection V/C	0.779											

Emissions

Vehicle Miles Traveled [mph]	1.82	5.81	1.48	1.51	0.47	3.25	201.06	200.54	5.89	145.74
Stops [stops/h]	34.21	121.41	42.61	43.10	13.06	14.14	290.65	290.15	51.40	859.85
Fuel consumption [US gal/h]	0.64	2.30	0.66	0.67	0.20	0.42	11.65	11.62	1.21	16.30
CO [g/h]	44.50	160.87	46.16	46.70	13.94	29.03	814.32	812.45	84.40	1139.41
NOx [g/h]	8.66	31.30	8.98	9.09	2.71	5.65	158.44	158.07	16.42	221.69
VOC [g/h]	10.31	37.28	10.70	10.82	3.23	6.73	188.73	188.29	19.56	264.07

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	52.75	52.75	52.75	52.75
I_p,int, Pedestrian LOS Score for Intersectio	2.027	2.163	2.771	2.835
Crosswalk LOS	B	B	C	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	474	474	316	316
d_b, Bicycle Delay [s]	36.84	36.84	44.92	45.05
I_b,int, Bicycle LOS Score for Intersection	1.837	1.731	2.692	3.556
Bicycle LOS	A	A	B	D

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Willow Rd/Bay Rd

Control Type:	Signalized	Delay (sec / veh):	21.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.925

Intersection Setup

Name	Bay Road		Willow Road		Willow Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	0	0	0	0
Entry Pocket Length [ft]	100.00	175.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	1	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	100.00	0.00	0.00
Speed [mph]	30.00		30.00		35.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		No		No	

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Volumes

Name	Bay Road		Willow Road		Willow Road	
Base Volume Input [veh/h]	545	54	52	1546	1203	406
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	60	26	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	545	54	52	1606	1229	406
Peak Hour Factor	0.9590	0.9590	0.9590	0.9590	0.9590	0.9590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	142	14	14	419	320	106
Total Analysis Volume [veh/h]	568	56	54	1675	1282	423
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	2		0		1	
v_ci, Inbound Pedestrian Volume crossing mi	1		0		2	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	3		10		6	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Isolated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	11.00

Phasing & Timing (Basic)

Control Type	Split	Split	Protected	Permissive	Permissive	Permissive
Signal Group	4	4	5	2	6	6
Auxiliary Signal Groups						
Maximum Green [s]	36	36	16	36	36	36
Amber [s]	3.2	3.2	3.0	4.5	4.5	4.5
All red [s]	1.0	1.0	0.5	1.0	1.0	1.0
Walk [s]	0	0	0	0	7	7
Pedestrian Clearance [s]	0	0	0	0	31	31
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.2	2.2	1.5	3.5	3.5	3.5
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	40	40	13	100	87	87
Lead / Lag	Lag	-	Lead	-	-	-
Minimum Green [s]	4	4	4	10	20	20
Vehicle Extension [s]	2.0	2.0	2.0	4.0	4.0	4.0
Minimum Recall	No		No	Yes	Yes	
Maximum Recall	No		No	No	No	
Pedestrian Recall	No		No	No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Calculated Cycle Length [s]	75	75	75	75	75	75
L, Total Lost Time per Cycle [s]	4.20	4.20	3.50	5.50	5.50	5.50
I1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.20	2.20	1.50	3.50	3.50	3.50
g_i, Effective Green Time [s]	26	26	3	40	33	33
g / C, Green / Cycle	0.34	0.34	0.04	0.53	0.44	0.44
(v / s)_i Volume / Saturation Flow Rate	0.32	0.04	0.03	0.47	0.36	0.27
s, saturation flow rate [veh/h]	1781	1567	1781	3560	3560	1550
c, Capacity [veh/h]	613	539	69	1876	1571	684
d1, Uniform Delay [s]	23.73	16.75	35.77	15.87	18.31	15.97
k, delay calibration	0.16	0.04	0.04	0.15	0.15	0.17
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.18	0.03	6.88	2.35	1.53	1.41
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.93	0.10	0.78	0.89	0.82	0.62
d, Delay for Lane Group [s/veh]	32.91	16.78	42.65	18.22	19.85	17.38
Lane Group LOS	C	B	D	B	B	B
Critical Lane Group	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	10.56	0.63	1.09	11.63	8.87	5.18
50th-Percentile Queue Length [ft/ln]	263.88	15.76	27.16	290.69	221.69	129.47
95th-Percentile Queue Length [veh/ln]	15.88	1.14	1.96	17.22	13.75	8.91
95th-Percentile Queue Length [ft/ln]	397.09	28.38	48.89	430.50	343.78	222.77

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	32.91	16.78	42.65	18.22	19.85	17.38
Movement LOS	C	B	D	B	B	B
d_A, Approach Delay [s/veh]	31.46		18.98		19.23	
Approach LOS	C		B		B	
d_I, Intersection Delay [s/veh]	21.01					
Intersection LOS	C					
Intersection V/C	0.925					

Emissions

Vehicle Miles Traveled [mph]	13.45	1.33	6.77	209.91	136.90	45.17
Stops [stops/h]	506.92	30.28	52.18	1116.83	851.72	248.70
Fuel consumption [US gal/h]	7.16	0.41	1.04	21.02	16.80	5.09
CO [g/h]	500.37	28.88	72.38	1469.49	1174.41	355.68
NOx [g/h]	97.35	5.62	14.08	285.91	228.50	69.20
VOC [g/h]	115.97	6.69	16.78	340.57	272.18	82.43

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	27.29	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.288	0.000	0.000
Crosswalk LOS	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	955	2521	2174
d_b, Bicycle Delay [s]	10.24	2.56	0.29
l_b,int, Bicycle LOS Score for Intersection	1.560	2.986	2.966
Bicycle LOS	A	C	C

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 15: Willow Rd/US-101 SB Ramps

Control Type:	Signalized	Delay (sec / veh):	73.2
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.376

Intersection Setup

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Approach	Southbound			Eastbound			Westbound			Northwestbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	1	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No					
Crosswalk	No			Yes			No			Yes		

Volumes

Name	US-101 SB Off-Ramp			Willow Road			Willow Road					
Base Volume Input [veh/h]	782	0	337	0	1655	375	0	1145	1475	0	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	0.00	2.00	0.00	2.00	2.00	0.00	2.00	2.00	0.00	0.00	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	3	0	28	32	0	23	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	782	0	340	0	1683	407	0	1168	1475	0	0	0
Peak Hour Factor	0.9624	1.0000	0.9624	1.0000	0.9624	0.9624	1.0000	0.9624	0.9624	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	203	0	88	0	437	106	0	303	383	0	0	0
Total Analysis Volume [veh/h]	813	0	353	0	1749	423	0	1214	1533	0	0	0
Presence of On-Street Parking	No		No	No		No	No		No			
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			1			10			0		

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Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	99.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Unsigna	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	4	0	0	0	2	0	0	6	0	0	0	0
Auxiliary Signal Groups												
Maximum Green [s]	30	0	0	0	16	0	0	16	0	0	0	0
Amber [s]	3.0	0.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0	0.0	0.0	0.0
All red [s]	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Walk [s]	5	0	0	0	5	0	0	5	0	0	0	0
Pedestrian Clearance [s]	10	0	0	0	11	0	0	11	0	0	0	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No				
l1, Start-Up Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
l2, Clearance Lost Time [s]	2.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	33	0	0	0	112	0	0	112	0	0	0	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	0	0	5	0	0	5	0	0	0	0
Vehicle Extension [s]	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Minimum Recall	No				Yes			Yes				
Maximum Recall	No				No			No				
Pedestrian Recall	No				No			No				

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	C	C	R	
C, Calculated Cycle Length [s]	145	145	145	145	145	
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	
l2, Clearance Lost Time [s]	2.00	2.00	2.00	2.00	2.00	
g_i, Effective Green Time [s]	29	29	108	108	108	
g / C, Green / Cycle	0.20	0.20	0.74	0.74	0.74	
(v / s)_i Volume / Saturation Flow Rate	0.24	0.13	0.34	0.24	0.99	
s, saturation flow rate [veh/h]	3459	2813	5094	5094	1550	
c, Capacity [veh/h]	692	563	3794	3794	1154	
d1, Uniform Delay [s]	58.00	53.06	7.19	6.20	17.24	
k, delay calibration	0.13	0.11	0.50	0.50	0.50	
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	
d2, Incremental Delay [s]	83.32	1.16	0.41	0.22	153.69	
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	
PF, progression factor	1.00	1.00	1.00	1.00	1.00	

Lane Group Results

X, volume / capacity	1.18	0.63	0.46	0.32	1.33	
d, Delay for Lane Group [s/veh]	141.32	54.21	7.59	6.42	170.93	
Lane Group LOS	F	D	A	A	F	
Critical Lane Group	Yes	No	No	No	Yes	
50th-Percentile Queue Length [veh/ln]	20.69	6.01	6.71	4.01	80.45	
50th-Percentile Queue Length [ft/ln]	517.19	150.29	167.67	100.16	2011.32	
95th-Percentile Queue Length [veh/ln]	30.58	10.03	10.95	7.21	118.89	
95th-Percentile Queue Length [ft/ln]	764.45	250.81	273.85	180.29	2972.31	

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Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	141.32	0.00	54.21	0.00	7.59	0.00	0.00	6.42	170.93	0.00	0.00	0.00
Movement LOS	F		D		A			A	F			
d_A, Approach Delay [s/veh]	114.95			6.16			98.23			0.00		
Approach LOS	F			A			F			A		
d_I, Intersection Delay [s/veh]	73.23											
Intersection LOS	E											
Intersection V/C	1.376											

Emissions

Vehicle Miles Traveled [mph]	19.28	8.37	186.76	134.53	169.89	
Stops [stops/h]	1027.25	298.50	499.53	298.41	1997.44	
Fuel consumption [US gal/h]	29.84	5.89	13.15	8.77	71.34	
CO [g/h]	2086.15	411.55	919.29	613.27	4986.80	
NOx [g/h]	405.89	80.07	178.86	119.32	970.25	
VOC [g/h]	483.49	95.38	213.05	142.13	1155.74	

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	9.0	0.0	9.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	63.78	0.00	63.78
I_p,int, Pedestrian LOS Score for Intersectio	0.000	3.080	0.000	1.447
Crosswalk LOS	F	C	F	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	400	1490	1490	0
d_b, Bicycle Delay [s]	46.40	4.72	4.74	72.50
I_b,int, Bicycle LOS Score for Intersection	1.560	2.522	3.070	4.132
Bicycle LOS	A	B	C	D

Sequence

Ring 1	-	2	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 16: Willow Rd/US-101 NB Ramps

Control Type:	Signalized	Delay (sec / veh):	185.8
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.193

Intersection Setup

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	0	0	0	0	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	200.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			No			No		

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Volumes

Name	US-101 NB Off-Ramp						Willow Road			Willow Road (SR 114)		
Base Volume Input [veh/h]	359	0	1254	0	0	0	0	2015	684	0	2167	852
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	14	0	0	0	0	0	0	22	6	0	9	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	373	0	1254	0	0	0	0	2037	690	0	2176	852
Peak Hour Factor	0.9741	1.0000	0.9741	0.9741	0.9741	0.9741	1.0000	0.9741	0.9741	1.0000	0.9741	0.9741
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	96	0	322	0	0	0	0	523	177	0	558	219
Total Analysis Volume [veh/h]	383	0	1287	0	0	0	0	2091	708	0	2234	875
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			2			4		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	145
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	2.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Split	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Overlap	Permiss
Signal Group	7	0	8	0	7	0	0	2	0	0	6	0
Auxiliary Signal Groups			7,8								6,8	
Maximum Green [s]	30	0	30	0	30	0	0	16	0	0	16	0
Amber [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0
Walk [s]	5	0	5	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	10	0	10	0	10	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No				No			No			No	
I1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	2.0	0.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	25	0	25	0	25	0	0	95	0	0	95	0
Lead / Lag	Lead	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	5	0	5	0	5	0	0	4	0	0	4	0
Vehicle Extension [s]	3.0	0.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall	No		No		No			No			No	
Maximum Recall	No		No		No			No			No	
Pedestrian Recall	No		No		No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

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Lane Group Calculations

Lane Group	L	R	C	C	R	C	R
C, Calculated Cycle Length [s]	145	145	145	145	145	145	145
L, Total Lost Time per Cycle [s]	4.00	4.00	4.00	4.00	4.00	4.00	4.00
I1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00
I2, Clearance Lost Time [s]	2.00	0.00	2.00	2.00	2.00	0.00	2.00
g_i, Effective Green Time [s]	21	46	21	91	91	116	91
g / C, Green / Cycle	0.14	0.32	0.14	0.63	0.63	0.80	0.63
(v / s)_i Volume / Saturation Flow Rate	0.14	0.78	0.00	0.70	0.46	0.74	0.96
s, saturation flow rate [veh/h]	2752	1658	1870	3003	1556	3003	916
c, Capacity [veh/h]	410	526	296	1884	976	2402	575
d1, Uniform Delay [s]	61.68	49.50	0.00	27.00	18.13	11.33	26.02
k, delay calibration	0.11	0.50	0.11	0.50	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	9.98	656.53	0.00	57.61	4.69	7.95	243.73
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.93	2.45	0.00	1.11	0.73	0.93	1.52
d, Delay for Lane Group [s/veh]	71.67	706.03	0.00	84.61	22.82	19.28	269.75
Lane Group LOS	E	F	A	F	C	B	F
Critical Lane Group	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	7.60	57.46	0.00	30.49	16.74	16.81	56.94
50th-Percentile Queue Length [ft/ln]	189.89	1436.46	0.00	762.17	418.46	420.28	1423.61
95th-Percentile Queue Length [veh/ln]	12.12	94.99	0.00	43.02	23.45	23.54	90.70
95th-Percentile Queue Length [ft/ln]	302.89	2374.87	0.00	1075.49	586.21	588.38	2267.46

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	71.67	0.00	706.03	0.00	0.00	0.00	0.00	84.61	22.82	0.00	19.28	269.75
Movement LOS	E		F	A	A	A		F	C		B	F
d_A, Approach Delay [s/veh]	560.55			0.00			68.98			89.77		
Approach LOS	F			A			E			F		
d_I, Intersection Delay [s/veh]	185.84											
Intersection LOS	F											
Intersection V/C	1.193											

Emissions

Vehicle Miles Traveled [mph]	9.08	30.51	0.00	231.72	78.46	52.80	20.68
Stops [stops/h]	377.16	2853.11	0.00	2270.76	415.58	1252.14	1413.79
Fuel consumption [US gal/h]	8.04	201.89	0.00	58.08	8.81	17.86	56.68
CO [g/h]	562.16	14111.80	0.00	4059.85	616.05	1248.11	3962.23
NOx [g/h]	109.38	2745.64	0.00	789.90	119.86	242.84	770.91
VOC [g/h]	130.29	3270.55	0.00	940.91	142.77	289.26	918.28

Other Modes

g_Walk,mi, Effective Walk Time [s]	9.0	9.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	63.78	63.78	0.00	0.00
l_p,int, Pedestrian LOS Score for Intersectio	2.788	2.165	0.000	0.000
Crosswalk LOS	C	B	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	290	290	1255	1600
d_b, Bicycle Delay [s]	53.02	53.02	10.07	2.91
l_b,int, Bicycle LOS Score for Intersection	1.560	1.560	3.099	3.270
Bicycle LOS	A	A	C	C

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	7	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: Ravenswood Ave/Laurel St

Control Type:	Signalized	Delay (sec / veh):	58.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.795

Intersection Setup

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	0
Entry Pocket Length [ft]	95.00	100.00	100.00	100.00	100.00	100.00	85.00	100.00	100.00	75.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00			25.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Laurel Street			Laurel Street			Ravenswood Avenue			Ravenswood Avenue		
Base Volume Input [veh/h]	235	224	37	40	190	24	101	584	160	78	455	62
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	7	0	0	16	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	235	224	37	40	190	24	101	591	160	78	471	62
Peak Hour Factor	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338	0.9338
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	63	60	10	11	51	6	27	158	43	21	126	17
Total Analysis Volume [veh/h]	252	240	40	43	203	26	108	633	171	84	504	66
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	20			17			18			20		
v_di, Inbound Pedestrian Volume crossing m	20			18			17			20		
v_co, Outbound Pedestrian Volume crossing	34			29			33			29		
v_ci, Inbound Pedestrian Volume crossing mi	33			29			34			29		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	20			7			1			5		

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Version 2024 (SP 0-6) 2/10/2026

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	120
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Beginning of First Yellow
Permissive Mode	SingleBand
Lost time [s]	4.00

Phasing & Timing (Basic)

Control Type	Split	Split	Split	Split	Split	Split	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	8	4	8	4	8	4	5	2	2	1	6	6
Auxiliary Signal Groups												
Maximum Green [s]	35	35	35	35	35	35	30	60	60	30	30	30
Amber [s]	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7
All red [s]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Walk [s]	7	7	7	7	7	7	0	7	7	0	7	7
Pedestrian Clearance [s]	16	16	16	16	16	16	0	22	22	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.0	2.0	2.0
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	28	28	28	28	28	28	9	55	55	9	55	55
Lead / Lag	Lag	-	-	Lag	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	4	4	4	4	4	4	4	4	4	4	4	4
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Recall		No			No		No	No		No	No	
Maximum Recall		Yes			Yes		No	No		No	No	
Pedestrian Recall		No			No		No	No		No	No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C
C, Calculated Cycle Length [s]	120	120	120	120	120	120	120	120
L, Total Lost Time per Cycle [s]	4.10	4.10	4.10	4.10	4.10	4.10	4.00	4.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.10	2.10	2.10	2.10	0.00	2.10	0.00	2.00
g_i, Effective Green Time [s]	24	24	24	24	60	51	60	51
g / C, Green / Cycle	0.20	0.20	0.20	0.20	0.50	0.42	0.50	0.43
(v / s)_i Volume / Saturation Flow Rate	0.14	0.16	0.02	0.13	0.11	0.46	0.10	0.32
s, saturation flow rate [veh/h]	1781	1772	1781	1815	951	1756	806	1808
c, Capacity [veh/h]	355	353	355	362	348	745	215	769
d1, Uniform Delay [s]	44.82	45.70	39.43	44.04	20.90	34.55	27.34	28.97
k, delay calibration	0.50	0.50	0.50	0.50	0.11	0.41	0.11	0.28
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.45	16.62	0.70	8.20	0.50	53.62	1.16	3.69
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.71	0.79	0.12	0.63	0.31	1.08	0.39	0.74
d, Delay for Lane Group [s/veh]	56.27	62.32	40.13	52.23	21.40	88.17	28.49	32.66
Lane Group LOS	E	E	D	D	C	F	C	C
Critical Lane Group	No	Yes	No	Yes	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	8.12	9.55	1.13	7.12	1.66	32.19	1.30	14.34
50th-Percentile Queue Length [ft/ln]	202.92	238.67	28.20	178.05	41.39	804.85	32.53	358.51
95th-Percentile Queue Length [veh/ln]	12.79	14.61	2.03	11.50	2.98	43.90	2.34	20.55
95th-Percentile Queue Length [ft/ln]	319.73	365.35	50.76	287.47	74.50	1097.58	58.55	513.77

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	56.27	62.32	62.32	40.13	52.23	52.23	21.40	88.17	88.17	28.49	32.66	32.66
Movement LOS	E	E	E	D	D	D	C	F	F	C	C	C
d_A, Approach Delay [s/veh]	59.45			50.32			80.26			32.12		
Approach LOS	E			D			F			C		
d_I, Intersection Delay [s/veh]	58.87											
Intersection LOS	E											
Intersection V/C	0.795											

Emissions

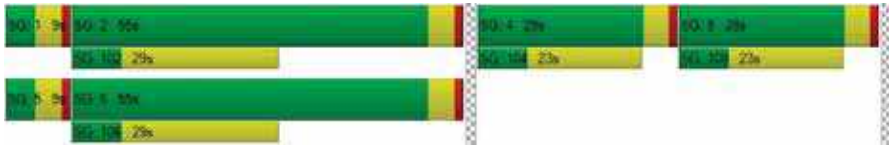
Vehicle Miles Traveled [mph]	5.97	6.63	1.02	5.43	25.63	190.83	32.20	218.52
Stops [stops/h]	243.51	286.41	33.84	213.66	49.66	965.82	39.04	430.21
Fuel consumption [US gal/h]	4.48	5.41	0.53	3.50	1.80	27.61	2.03	15.16
CO [g/h]	312.89	377.86	36.82	244.49	125.82	1930.28	141.78	1059.71
NOx [g/h]	60.88	73.52	7.16	47.57	24.48	375.56	27.59	206.18
VOC [g/h]	72.52	87.57	8.53	56.66	29.16	447.36	32.86	245.60

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	49.50	49.50	49.50	49.50
l_p,int, Pedestrian LOS Score for Intersectio	2.329	2.207	2.558	2.399
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	390	390	838	838
d_b, Bicycle Delay [s]	39.27	39.02	20.25	20.29
l_b,int, Bicycle LOS Score for Intersection	2.437	2.008	3.064	2.639
Bicycle LOS	B	B	C	B

Sequence

Ring 1	1	2	4	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 10: Middlefield Rd-Willow Rd

Control Type:	Signalized	Delay (sec / veh):	63.1
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.829

Intersection Setup

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	1	0	0	1	0	1	1	0	1
Entry Pocket Length [ft]	125.00	100.00	70.00	270.00	100.00	100.00	75.00	100.00	215.00	155.00	100.00	160.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.21
Speed [mph]	30.00			30.00			30.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Volumes

Name	Middlefield Road			Middlefield Road			Willow Road			Willow Road		
Base Volume Input [veh/h]	105	415	330	234	451	27	31	374	277	465	151	374
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	2	0	60	5	0	0	0	0	0	0	26
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	105	417	330	294	456	27	31	374	277	465	151	400
Peak Hour Factor	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581	0.9581
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	109	86	77	119	7	8	98	72	121	39	104
Total Analysis Volume [veh/h]	110	435	344	307	476	28	32	390	289	485	158	417
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			6			0			6		
v_di, Inbound Pedestrian Volume crossing m	0			6			0			6		
v_co, Outbound Pedestrian Volume crossing	4			5			5			5		
v_ci, Inbound Pedestrian Volume crossing mi	5			5			5			4		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			14			50			19		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	140
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	71.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	8.00

Phasing & Timing (Basic)

Control Type	Permiss	Permiss	Permiss	Split	Permiss	Split	Split	Split	Permiss	Permiss	Split	Split
Signal Group	0	3	0	2	2	2	8	1	0	0	4	4
Auxiliary Signal Groups												
Maximum Green [s]	0	45	0	30	30	30	0	40	0	0	45	45
Amber [s]	0.0	3.7	0.0	3.7	3.7	3.7	0.0	3.3	0.0	0.0	3.7	3.7
All red [s]	0.0	1.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	0.0	1.0	1.0
Walk [s]	0	8	0	8	8	8	0	8	0	0	8	8
Pedestrian Clearance [s]	0	17	0	18	18	18	0	20	0	0	22	22
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	2.0
I2, Clearance Lost Time [s]	0.0	2.7	0.0	2.7	2.7	2.7	0.0	2.3	0.0	0.0	2.7	2.7
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advanced Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Phasing & Timing: Pattern 1

Split [s]	0	30	0	31	31	31	0	39	0	0	40	40
Lead / Lag	-	-	-	Lag	-	-	-	-	-	-	-	-
Minimum Green [s]	0	5	0	5	5	5	0	5	0	0	5	5
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	3.0
Minimum Recall		No			No			No			No	
Maximum Recall		No			No			No			No	
Pedestrian Recall		No			No			No			No	

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Generated with PTV VISTRO
Version 2024 (SP 0-6) 2/10/2026

Lane Group Calculations

Lane Group	L	C	C	R	L	C	C	L	C	R	L	C	R
C, Calculated Cycle Length [s]	140	140	140	140	140	140	140	140	140	140	140	140	140
L, Total Lost Time per Cycle [s]	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.30	4.30	4.30	4.70	4.70	4.70
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.30	2.30	2.30	2.70	2.70	2.70
g_i, Effective Green Time [s]	24	24	24	24	24	24	24	32	32	32	42	42	42
g / C, Green / Cycle	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.23	0.23	0.23	0.30	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.06	0.15	0.15	0.15	0.15	0.15	0.15	0.02	0.21	0.19	0.18	0.18	0.27
s, saturation flow rate [veh/h]	1781	1870	1725	1548	1781	1855	1818	1781	1870	1492	1781	1824	1548
c, Capacity [veh/h]	310	325	300	269	308	320	314	402	422	336	528	540	459
d1, Uniform Delay [s]	50.90	56.15	56.28	56.17	56.25	56.24	56.34	42.76	53.05	51.32	42.30	42.08	46.99
k, delay calibration	0.11	0.11	0.11	0.11	0.21	0.21	0.22	0.11	0.26	0.22	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.69	6.62	7.67	9.28	12.67	12.14	13.30	0.08	17.72	11.98	5.17	4.77	24.55
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.35	0.86	0.87	0.88	0.86	0.86	0.87	0.08	0.92	0.86	0.61	0.59	0.91
d, Delay for Lane Group [s/veh]	51.59	62.77	63.95	65.45	68.93	68.38	69.64	42.84	70.78	63.29	47.46	46.85	71.54
Lane Group LOS	D	E	E	E	E	E	E	D	E	E	D	D	E
Critical Lane Group	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.49	10.21	9.64	8.88	10.17	10.53	10.53	0.90	15.50	10.74	10.45	10.35	17.09
50th-Percentile Queue Length [ft/ln]	87.15	255.3	240.9	221.9	254.14	263.28	263.36	22.43	387.56	268.59	261.14	258.86	427.20
95th-Percentile Queue Length [veh/ln]	6.28	15.46	14.73	13.77	15.39	15.85	15.86	1.61	21.96	16.12	15.75	15.63	23.87
95th-Percentile Queue Length [ft/ln]	156.8	386.3	368.2	344.1	384.86	396.33	396.43	40.37	549.00	402.98	393.65	390.79	596.69

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	51.59	63.19	65.06	68.86	69.03	69.64	42.84	70.78	63.29	47.25	46.85	71.54
Movement LOS	D	E	E	E	E	E	D	E	E	D	D	E
d_A, Approach Delay [s/veh]	62.45			68.98			66.48			56.75		
Approach LOS	E			E			E			E		
d_I, Intersection Delay [s/veh]	63.06											
Intersection LOS	E											
Intersection V/C	0.829											

Emissions

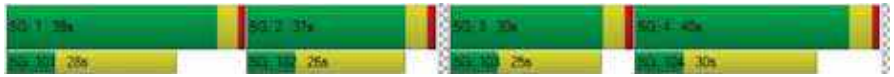
Vehicle Miles Traveled [mph]	3.15	8.02	7.49	6.82	85.47	88.95	88.07	0.76	9.24	6.85	136.68	136.68	177.29
Stops [stops/h]	89.64	262.6	247.8	228.3	261.40	270.80	270.88	23.07	398.64	276.26	268.60	266.26	439.41
Fuel consumption [US gal/h]	1.78	5.35	5.08	4.71	8.67	8.98	8.98	0.44	8.20	5.53	10.28	10.23	15.73
CO [g/h]	124.4	374.2	354.8	329.4	605.75	627.79	627.55	30.59	573.11	386.55	718.70	715.27	1099.39
NOx [g/h]	24.20	72.82	69.03	64.09	117.86	122.15	122.10	5.95	111.51	75.21	139.83	139.16	213.90
VOC [g/h]	28.83	86.74	82.23	76.34	140.39	145.50	145.44	7.09	132.82	89.59	166.57	165.77	254.79

Other Modes

g_Walk,mi, Effective Walk Time [s]	12.0	12.0	12.0	12.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	58.51	58.51	58.51	58.51
l_p,int, Pedestrian LOS Score for Intersectio	2.821	2.651	2.397	2.662
Crosswalk LOS	C	B	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	361	376	496	504
d_b, Bicycle Delay [s]	46.99	46.50	40.62	39.53
l_b,int, Bicycle LOS Score for Intersection	2.293	2.229	2.733	3.309
Bicycle LOS	B	B	B	C

Sequence

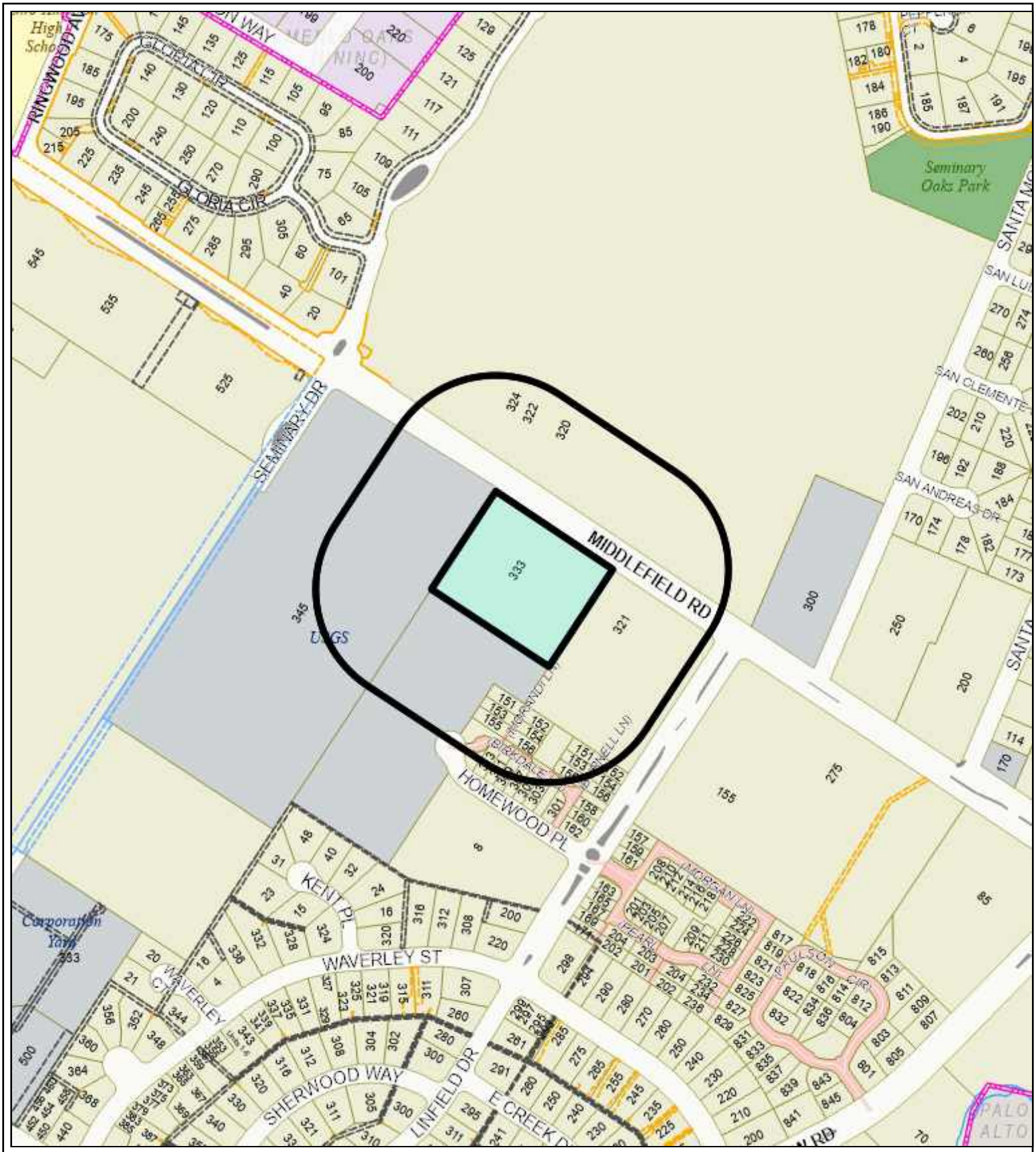
Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



LOCATION: 333 Middlefield Road	PROJECT NUMBER: PLN2025-00040	APPLICANT: Atria Health and Research Institute	OWNER: Bohannon Development Company

PROJECT CONDITIONS:

1. The use permit shall be subject to the following standard conditions:
    a. Development of the project shall be substantially in conformance with the plans entitled "Atria Menlo Park" consisting of 31 sheets, dated February 27, 2026, and the project description letter, dated February 17, 2026, and approved by the Planning Commission on March 9, 2026, except as modified by the conditions contained herein, subject to review and approval of the Planning Division.
    b. The applicant shall pay all fees incurred through staff time spent reviewing the application.
    c. The applicant or permittee shall defend, indemnify, and hold harmless the City of Menlo Park or its agents, officers, and employees from any claim, action, or proceeding against the City of Menlo Park or its agents, officers, or employees to attack, set aside, void, or annul an approval of the Planning Commission, City Council, Community Development Director, or any other department, committee, or agency of the City concerning a development, variance, permit, or land use approval which action is brought within the time period provided for in any applicable statute; provided, however, that the applicant's or permittee's duty to so defend, indemnify, and hold harmless shall be subject to the City's promptly notifying the applicant or permittee of any said claim, action, or proceeding and the City's full cooperation in the applicant's or permittee's defense of said claims, actions, or proceedings.
    d. Notice of Fees Protest – The applicant may protest any fees, dedications, reservations, or other exactions imposed by the City as part of the approval or as a condition of approval of this development. Per California Government Code 66020, this 90-day protest period has begun as of the date of the approval of this application.
2. The following project-specific conditions apply to office uses established with and following the 2026 use permit revision:
    a. General office uses (excluding medical and dental) remain permitted at the site, consistent with the original use permit.
    b. Prior to building permit issuance, in accordance with Menlo Park Municipal Code Chapter 13.26, the project sponsor must complete payment for the applicable transportation impact fee ($1,917,903) to the City, to the satisfaction of the Engineering Division.
    c. The property owner shall ensure compliance with the San Mateo County Congestion Management Program Land Use Implementation Policy (C/CAG TDM Policy). Specifically, the property owner shall ensure that the measures identified in the approved C/CAG TDM Checklist appended to this application are implemented over the life of the project, and that the property owner and tenants acknowledge the requirement to participate in the periodic monitoring and reporting requirements identified in the C/CAG TDM Policy. Accordingly, the property owner and/or developer shall clearly identify these TDM provisions and responsibilities in any sales and/or lease or sublease transactions.



City of Menlo Park

Location Map

CITY OF MENLO PARK

Scale: 1:4,000 | Drawn By: CC | Checked By: TAS | Date: 3/9/2026 | Sheet: 1

C/CAG TDM Checklist

ccagtdm.org

Medical & Lodging Land Use: Small Project

100-499 ADT; ~10,000-49,999 sq ft

About this Form

Any new development project anticipated to generate at least 100 average daily trips is subject to the C/CAG TDM Policy and must complete a TDM Checklist and implement associated measures to mitigate traffic impacts. Read more at ccagtdm.org

Questions?
support@ccagtdm.org

A Applicant Information

Project Address: 333 Middlefield Dr, Menlo Park, CA 94025	Contact First and Last Name: Seema Otoya
Parcel Number:	Application Date: D D M M Y Y Y Y
Project Jurisdiction:	Contact Phone Address: 206-498-1074
	Contact Email Address: seema.otoya@atria.org

B Trip Reduction Target

Select one option based on your project's distance to high quality transit

Read more about high quality transit at ccagtdm.org/high-quality-transit

Identify your project type

☐ TOD	◉ Transit Proximate	☐ Non-Transit Proximate
Less than 1/2-mile from high quality transit service	1/2 to 3 miles from high quality transit service	More than 3 miles from high quality transit service
25% Trip Reduction Required	**35%** Trip Reduction Required	**35%** Trip Reduction Required

C Required Measures

You must select all measures that apply for your project type

Click on each measure's title for more information

	Measure	Project Types	Percentage	Yes
1	**M3 - TDM Coordinator/Contact Person** Provide TDM coordinator/liaison for tenants. May be contracted through 3rd party provider, such as Commute.org.	ALL	0.5%	☑
2	**M4 - Actively Participate in Commute.org or Transportation Management Association (TMA) Equivalent** Obtain certification of registration from Commute.org or equivalent TMA incorporation documents.	ALL	6.5%	☑
3	**M5 - Carpool or Vanpool Program** Establish carpool/vanpool program for tenants and register program with Commute.org.	ALL	2%	☑
4	**M6 - Transit or Ridesharing Passes/Subsidies** Offer tenants passes or subsidies for monthly public transit or ridesharing costs incurred, equivalent to 30% of value or $50 - whichever is lower.	ALL	10%	☑
5	**M7 - Pre-Tax Transportation Benefits** Offer option for tenants to participate in a pre-tax transit program to encourage the use of sustainable transportation modes and leverage pre-tax income to pay for commute trip costs.	ALL	1%	☑
6	**M9 - Design Streets to Encourage Bike/Ped Access** Design adjacent streets or roadways to facilitate multimodal travel.	ALL	1%	☐
7	**M24 - Pedestrian Oriented Uses & Amenities on Ground Floor** Provide on-site, visible amenities to tenants and guests, such as cafes, gyms, childcare, retail.	ALL	3%	☑
8	**Total from Required Measures** Sum percentages from each selected measure from rows 1-7		23 %	

Form Continues on Page 2 →

D Additional Recommended

Select enough to meet the trip reduction target from section B

Click on each measure's title for more information

	Measure	Project Types	Percentage	Yes
9	**M1 - Free/Preferential Parking for Carpools** Provide free or preferential parking, including reserved spaces or spaces near an entrance or other desirable location, to incentivize ridesharing.	ALL	1%	☑
10	**M8 - Secure Bicycle Storage** Comply with CalGREEN minimum bicycle parking requirements.	ALL	1%	☑
11	**M13 - Telemedicine** This measure implements telecommunications in lieu of in-patient visits. Only for Medical Land Uses	ALL	5%	☑
12	**M14 - Paid Parking at Market Rate** Offer hourly/daily parking rates proportional to monthly rate or equivalent to cost of transit fare.	ALL	25%	☐
13	**M15 - Reduced Parking** Provide off-street parking at least 10% below locally-required minimums, or else below the locally-permitted parking maximums. Consideration may be required of potential spillover parking into surrounding areas.	ALL	10%	☐
14	**M16 - Short-Term Daily Parking** Offer daily or hourly parking rates that are proportional to the monthly rate or approximately the cost of a transit fare.	ALL	2%	☐
15	**M17 - Developer TDM Fee/TDM Fund** Voluntary impact fee payment on a per unit or square footage basis, to fund the implementation of TDM programs.	ALL	4%	☐
16	**M18 - Car Share On-Site** Provide on-site car share or vehicle fleets.	ALL	1%	☐
17	**M19 - Land Dedication or Capital Improvements for Transit** Contribute space on, or adjacent to, the project site for transit improvements. Select one or more Bus Pullout Space 1% ☐ Bus Shelter 1% ☐ Visual/Electrical Improvements (i.e., Lighting, Signage) 1% ☐ Other (i.e., Micromobility Parking Zone, TNC Loading Zone) 1% ☐	ALL	→ ____ % Total percentages selected	☐
18	**M20 - Shuttle Program/Shuttle Consortium/Fund Transit Service** Establish a shuttle service to regional transit hubs or commercial centers. Shuttle service should be provided free of charge to employees and guests.	Transit Proximate & Non-Transit Proximate	10%	☐
19	**M21 - Bike/Scooter Share On-Site** Allocate space for bike/scooter share parking.	All	1%	☑
20	**M22 - Active Transportation Subsidies** Offer biking/walking incentives to tenants, such as gift card/product raffles.	All	2%	☑
21	**M23 - Gap Closure** Construct or enhance quality of biking and walking facilities to/from site to existing trails, bikeways, and/or adjacent streets.	All	7%	☐
22	**M24 - Bike Repair Station** Offer on-site bike repair space/tools in visible, secure area.	All	0.5%	☐
23	**M25 - Showers, Lockers, and Changing Rooms for Cyclists** These amenities serve as end of trip facilities for employees arriving by bike or other active transportation forms.	All	2%	☑
24		**Total from Additional Measures** Sum percentages from each selected measure from rows 9 - 23	12 %	

E Project Totals

Percentage from Required Measures (Section C Row 8): 23 %

\+ Percentage from Additional Measures (Section D Row 24): 12 %

Total Percentage from all Selected Measures (Sum of required and additional measures): 35 %

Trip Reduction Target (Copy from Section B): 35 %

Total Percentage from all selected measures must be greater than or equal to Trip Reduction Target

F Submit Checklist

See ccagtdm.org/submission for how to submit this form.

Questions?

Email Us
support@ccagtdm.org

Visit Our Website
ccagtdm.org